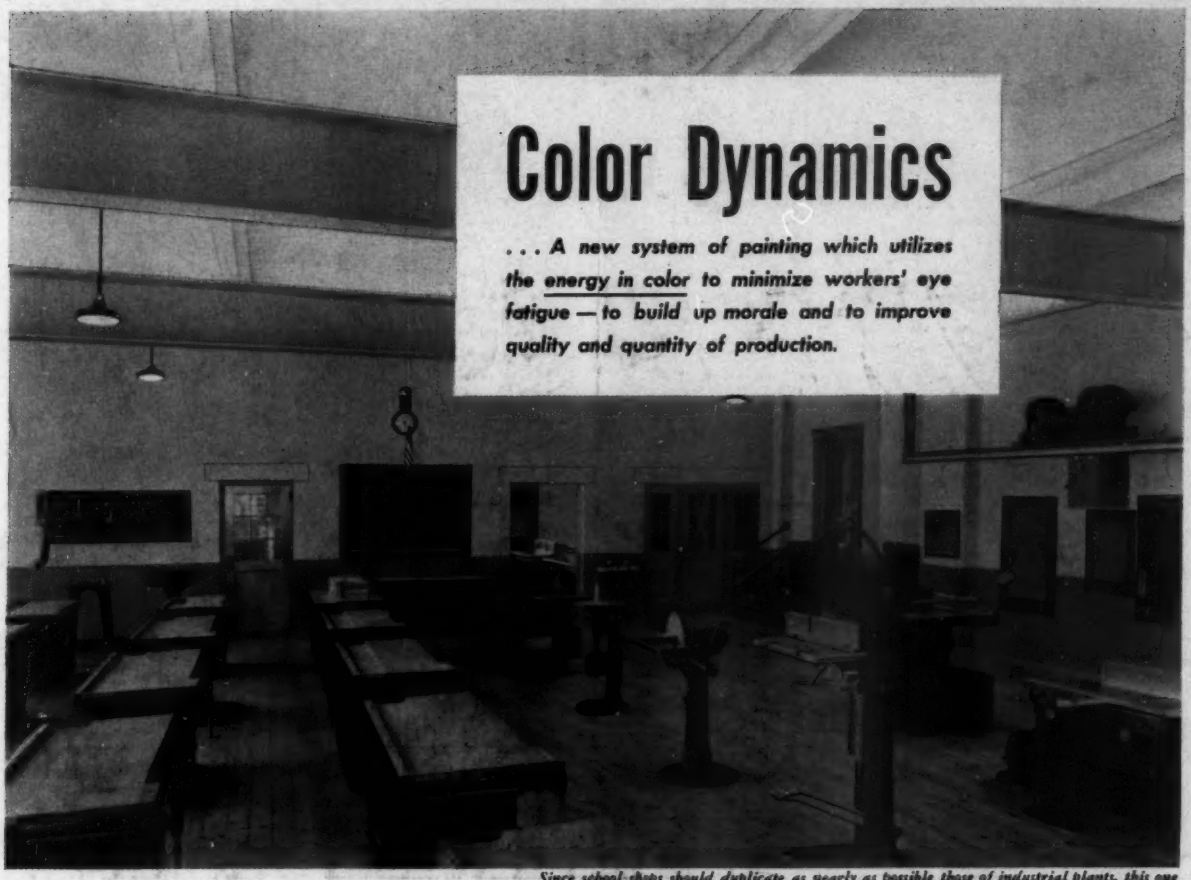
April, 1947 Vol. 36, No. 4

LIBRARY
MAR 24 1947
DETROIT

-IAVE-

INDUSTRIAL ARTS AND VOCATIONAL EDUCATION

The Shop Teachers' Professional Magazine



Color Dynamics

. . . A new system of painting which utilizes the energy in color to minimize workers' eye fatigue — to build up morale and to improve quality and quantity of production.

Since school-shops should duplicate as nearly as possible those of industrial plants, this one has been painted according to the principles of COLOR DYNAMICS as applied to industry.

Tomorrow's Skilled Shopmen Must Know How COLOR DYNAMICS Improves Production Techniques

THE knowledge of the skilled shopman of tomorrow will not be confined merely to metals, machines and methods.

He will also know how to make use of color in plant maintenance in order to turn out more and better work.

That's why many industrial and vocational schools are including the study of COLOR DYNAMICS in their training courses.

Pittsburgh's COLOR DYNAMICS is a complete and comprehensive system which makes use of the *energy in color* to improve the quantity and quality of output.

In this system, colors are classified according to their influence upon normal human beings. *Focal* colors lessen eye fatigue and nervous tension. *Eye-rest* colors relax the eyes of the worker. *Morale-building* colors promote cheerfulness and restrain mental depression. They promote better relations between workers and management. *Safety* colors reduce accident hazards by warning of impending danger.

COLOR DYNAMICS has been applied successfully in many hundreds of leading plants. It is now recognized as a distinct advance in production technique.

Begin now to teach your students COLOR DYNAMICS. For a practical demonstration of its benefits, paint the walls, floors, ceilings and machines of your manual training rooms according to this method. You'll be pleased with the results.

Write today for a free copy of our new and enlarged edition of "COLOR DYNAMICS" in which a number of successful applications of this system are fully and clearly explained. Packed with interesting data, it can serve as an excellent text book. Pittsburgh Plate Glass Company, Department IV-4, Pittsburgh 22, Pennsylvania.

PPG

PITTSBURGH PAINTS

PITTSBURGH PLATE GLASS COMPANY, PITTSBURGH, PA.

PITTSBURGH STANDS FOR QUALITY PAINT AND GLASS

Basic Equipment for Basic Instruction

Western Michigan College of Education

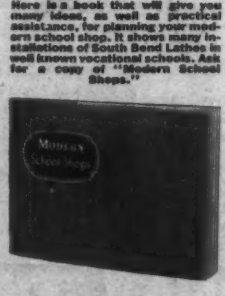
SOUTH BEND LATHES

Basic instruction for student machinists centers around the lathe, the basic machine tool. No training equipment should be chosen with greater care and attention. Lathes selected for the modern vocational shop or school should be versatile, ruggedly built, precision tools; ease of operation and safety are other important qualities. They should have a wide range of spindle speeds for machining the many materials with which the student should be thoroughly familiar today. Above all, the lathes used for instruction should be as modern as those which industry uses.

On this basis, it is significant that batteries of South Bend Precision Lathes have been chosen, exclusively, for some of the largest, most modern vocational shops in the country. If you specify, approve or decide upon the equipment for your school or shop, we shall be glad to send you a copy of Catalog 100 showing, in color, all types and sizes of South Bend Precision Lathes.

SEND FOR THIS BOOK

Here is a book that will give you many ideas, as well as practical assistance, for planning your modern school shop. It shows many installations of South Bend Lathes in well known vocational schools. Ask for a copy of "Modern School Shops."



LATHE BUILDERS SINCE 1906

SOUTH BEND LATHE WORKS

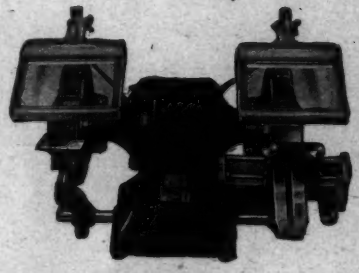
466 EAST MADISON STREET • • • SOUTH BEND 22, INDIANA

Put Skill in Student Hands

WITH STANLEY ELECTRIC TOOLS!

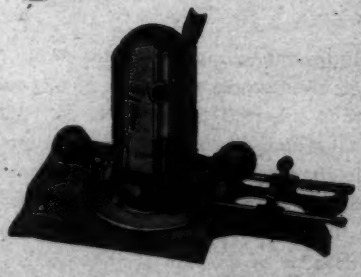
ELECTRIC DRILL No. 121. A powerful, light-weight tool for wood and metal drilling. ½" capacity. Sturdy construction and a well powered motor. Can be used with Stanley Bench Drill Stand No. 533 for a practical drill press. Other drills: capacities ¼" to 1".

BENCH GRINDER No. 677. Ideal for school woodworking shops. Special ⅓ h.p. motor. "Flud-Lite" Eye Shields to protect operator. Lights go on and off with grinder switch. 7" x 1" wheels. Has patented attachment for grinding plane irons up to 2⅜" wide and any size chisel.



METAL CUTTING SHEARS No. 214 Unishear. Cuts up to 14 gauge steel 15 to 20 feet per minute, straight lines, curves, angles with hair-line accuracy. Light weight, easy to handle. Improved method of blade adjustment. Other Unishears cut 18 to 8 gauge steel.

ROUTER-SHAPER No. 10A. Will rout for inlays, do shaping, relief work, dovetails, carving, veining, template work, beading and fluting. Highly versatile. Change the bit and you change the tool, and you can add new bits as you need them.



Write for No. 67 general catalog and No. 607 Router-Shaper catalog.

Stanley Electric Tools, Educational Dept.,
112 Elm St., New Britain, Connecticut.

Remember To Specify

STANLEY

Trade Mark

HARDWARE HAND TOOLS · ELECTRIC TOOLS

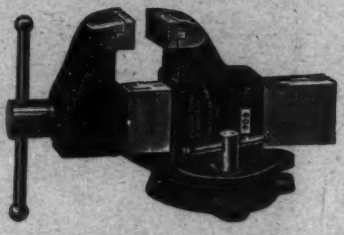
The Greatest Name In Tools

COLUMBIAN VISES

INDUSTRY'S FIRST CHOICE FOR OVER THIRTY YEARS

Columbian Continuous screw Woodworker's vises are furnished with hard wood handles — or may be equipped with ADJUSTABLE STEEL HANDLES, as above, to eliminate handle breakage, speed operation and provide extra leverage.

The complete line of Columbian Vises is designed to excel in its field—all are made to the same high standard of engineering and workmanship. A vise for every need and purpose.



Columbian Machinist's Vises are made of malleable iron castings, guaranteed unbreakable, and designed to provide accurate, dependable equipment for school and industrial shops. All standard types.

THE COLUMBIAN VISE & MFG. CO.
9022 BESSEMER AVENUE CLEVELAND, OHIO
THE WORLD'S LARGEST MAKERS OF VISES

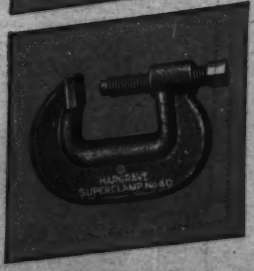
Ⓗ HARGRAVE

INDIVIDUALLY TESTED **CLAMPS**

IMPROVED SPRING CLAMP
Hargrave Improved Spring Clamp grips working piece firmly without marring. Can be applied or removed instantly.

HARGRAVE NO. 540
Standard Carriage Clamps. One of the most popular of our clamps. Malleable iron, designed for greatest strength for weight.

HARGRAVE NO. 40
Forged Steel Superclamps are load tested on a power-driven hydraulic testing machine. Hargrave No. 40 has square head screw with N.S.D. thread and dog point.



WRITE FOR CATALOG showing complete line of Hargrave Clamps, Chisels, Punches, File Cleaners, Washer Cutters, and Brace Wrenches.

THERE IS AN INDUSTRIAL DISTRIBUTOR NEAR YOU.

The CINCINNATI TOOL Co.

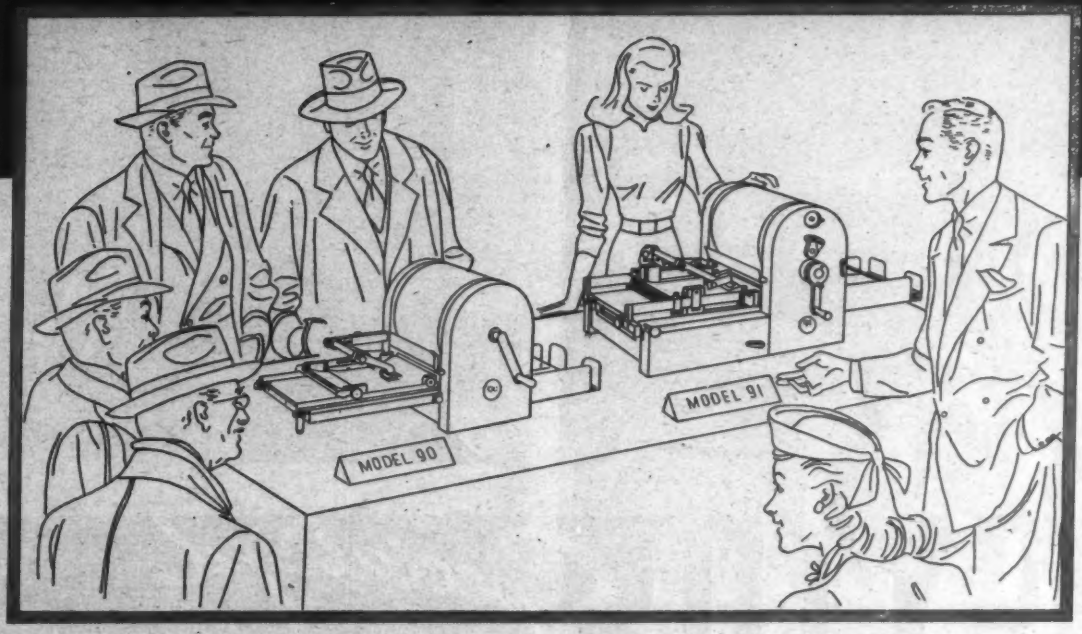
4039 Montgomery Road Cincinnati 12, Ohio

INDUSTRIAL ARTS AND VOCATIONAL EDUCATION, April, 1947, Volume 36, No. 4. Published monthly, except July and August, by The Bruce Publishing Co., 540 N. Milwaukee St., Milwaukee 1, Wis. Entered as Second-Class Matter January 2, 1914, at the Post Office at Milwaukee 1, Wis., under the act of March 3, 1879. Subscription price in the U. S., Canada, and countries of the Pan-American Union, $2.50 per year; Foreign, $3.00; Single copies, 35 cents.

Ready, willing and able . . .

AND PROMPT DELIVERY, TOO!

Automatic feed, hand-operated Mimeograph brand duplicators



MODEL 90—turns out those clear, readable copies —in color or in black-and-white—quickly, efficiently and at low cost. Popular price.

MODEL 91—put it to solving those paper work problems—get quality results economically. Free instruction if needed. Medium price.

Easier Stencil Preparation— Better Duplicated Copies

The new high-visibility cushion sheet for use with Mimeotype (blue) stencil sheets is a major improvement in stencil duplicating.

High visibility—easier on the eyes when typing stencil and proofreading. Easier, quicker corrections.

High copy quality, sharp letter outlines, blacker reproduction.

Ask your distributor for details.

COPYRIGHT 1947, A. B. DICK COMPANY

A. B. DICK COMPANY, Dept. IA-447
720 West Jackson Boulevard, Chicago 6, Illinois

☐ Place my order for.....Model.....Mimeograph brand duplicator with the distributor nearest me.

☐ Have a salesman call.

☐ Send me more information on Model.....

NAME.....

ORGANIZATION.....

ADDRESS.....

CITY.....STATE.....

The Mimeograph brand duplicator

IS MADE BY A. B. DICK COMPANY · CHICAGO

MIMEOGRAPH is the trade-mark of A. B. Dick Company, Chicago, registered in the U. S. Patent Office.

Students develop SPEED, DEXTERITY, and CONFIDENCE

...when they train with Snap-on Tools

Modern tools are indispensable to sound training. That's why so many vocational teachers insist on Snap-ons. These tools have the engineered design... proper balance... finish... and construction that invites speed, dexterity, and confidence. Students know they're working with tools that are the choice of better mechanics.

Snap-on offers you the services and counsel of tool experts, located in principal cities from coast to coast. Write for the address of the nearest Snap-on branch and new complete catalog of 4,000 Snap-on tools.

SNAP-ON TOOLS CORPORATION

8074-D 28th AVE.
KENOSHA, WIS.

PEXTO Specialized MACHINERY AND TOOLS

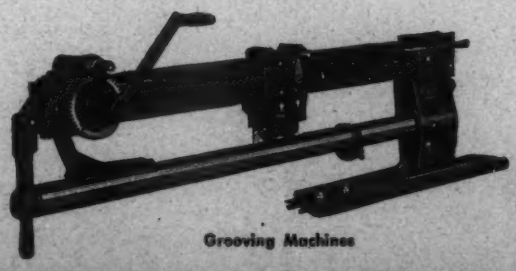
TO SPEED THE STUDENT ON HIS WAY TO CRAFTSMAN

Many steps on the road to Sheet Metal Craftsmanship may be saved by the student who learns on PEXTO Machines and Tools. And too, he will have greater appreciation for fine work which only such fine tools produce. To insure a successful finish, make a good start with PEXTO.

Supervisors and Instructors... write for Bulletin SB-35

Motor Driven Combination Rotary Machines

Folding Machines



Grooving Machines

THE PECK, STOW & WILCOX COMPANY · *Since 1785* SOUTHINGTON, CONNECTICUT, U. S. A.

TEACH SHEET METAL SHEARING THIS FAST, EASY WAY!

*A Black & Decker Trade Name

YOUR students will catch on fast when you teach correct sheet metal shearing with Black & Decker Electric PORTO-SHEARS. Combining powerful shearing action with surprisingly rapid speed, PORTO-SHEARS cut sheet metal too tough for snips . . . speed up jobs where snips are slow . . . feed easily with only a light forward pressure.

CUTTING OPERATION ALWAYS VISIBLE

Students can watch PORTO-SHEARS cut through the work. That's why they'll find it easier to follow straight lines, irregular patterns, curves down to 3/4" radius, without rejects. They'll leave no burrs or ragged edges, either, because PORTO-SHEARS make cleaner, smoother, more accurate cuts.

CUT MANY MATERIALS

Black & Decker 16-Gage PORTO-SHEARS cut up to rated capacity in steel or galvanized iron—about one gage thinner in Monel or stainless—50% above rating in copper, aluminum, lead and other non-ferrous metals. Can be adapted to cut thin sections of laminated wood or sheet plastics.

SEE YOUR BLACK & DECKER DISTRIBUTOR for full information on PORTO-SHEARS and help on any tooling problem. For our complete catalog, write to: The Black & Decker Mfg. Co., 680 Pennsylvania Ave., Towson 4, Maryland.

LEADING DISTRIBUTORS EVERYWHERE SELL

Black & Decker

PORTABLE ELECTRIC **TOOLS**

They Learn Today
They Earn Tomorrow

Photo courtesy of Crosley Radio Corporation

with KESTER CORED SOLDERS

Teach students soldering with Kester Cored Solders and fit them for top earnings in industry. To learn soldering the Kester way is to learn the fast, clean and dependable soldering job demanded by modern manufacture and maintenance.

Quickly and easily applied, Kester Cored Solders simplify the task of teaching, make the job of learning quick and thorough. Scientifically balanced with superior alloys, the self-contained flux in Kester Cored Solders eliminates the inconvenience of flux pots and equipment-damaging splatters. Flux and solder are both applied in a single, time-saving operation.

The name Kester has been synonymous with the finest top quality solders for nearly half a century. There's a correctly compounded Kester Solder in the right combination for any given soldering operation. Contact your supply house for Kester Rosin-Core Solder for electrical work; Kester Acid-Core Solder for general soldering.

KESTER SOLDER COMPANY
4257 WRIGHTWOOD AVENUE, CHICAGO 39, ILLINOIS
Eastern Plant: Newark, N. J. Canadian Plant: Brantford, Ontario

KESTER
FLUX-FILLED SOLDER

ARMSTRONG *Carbide* TOOL HOLDERS

for Higher Speeds, and Heavier Feeds

ARMSTRONG Carbide Tool Holders and ARMIDE (Carbide Tipped) Cutters come in cased sets for tool rooms and maintenance departments, and individually in all sizes for general machine shop and production turning. They permit not only the ready machining of sand-filled castings, the hardest and toughest steels as well as many heretofore "unmachineable" materials, but also make practical much heavier cuts and cutting speeds up to 600 f.p.m. on ordinary work. They also run from 10 to 100 times as long between regrindings.

Write for ARMSTRONG Carbide Bulletin.

ARMSTRONG BROS. TOOL CO.
"The Tool Holder People"
322 N. Francisco Avenue Chicago, U. S. A.
New York San Francisco

THESE
Fine Plywoods
can double enthusiasm for Wood-Working Projects!

Your students will find an extra thrill in working with fine plywoods—Mahogany, Curly Birch, Bird's Eye Maple, Havella! They'll put more interest and care into their work—take extra pride in the added beauty of the finished project.

We have available a complete stock of fine plywoods in many standard thicknesses, and in a variety of panel and cabinet grade sizes especially suited for the school workshop. Send today for complete catalog of plywood and craftsmen supplies.

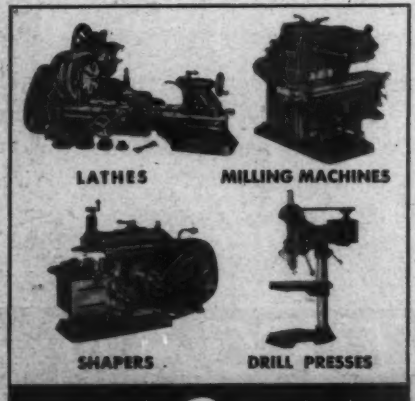
CARMEN-BRONSON CO.
165 EAST 3RD ST. DEPT. 4-V MT. VERNON, N.Y.

Students using one of the 30 Atlas lathes in Hadley Technical High School, St. Louis

Give Your Students Complete Versatility at Lower Cost with Compact Atlas Tools

Familiarity with the fundamental machining operations of all kinds of shop tools — *plus skill and confidence in working with them* — is the goal for industrial arts programs recommended by consultations with business leaders.

The Atlas 4 Tool Team is perfectly suited for such a course of instruction. The tools are compactly designed — bench size give you the most pupil stations in limited space. Their engineered precision enables you to demonstrate — and students to practice — all fundamental machining operations to close tolerances, encouraging accurate work habits. The tools are ruggedly built to stand up under inexpert student use. And highly important — advanced production methods reduce costs to make the most of a limited budget.



There is still time to make requisitions and place orders for delivery and installation before school opens next Fall. Send for latest catalog with complete specifications and prices.

ATLAS PRESS COMPANY
471 N. PITCHER ST., KALAMAZOO 13, MICHIGAN

ATKINS
Silver Steel SAWS

Doing Good Work is— Doing What Comes Naturally

How well will *your* pupils meet the challenge of their chosen trade? The answer to that hinges in largest measure on the assurance they acquire through your teaching — assurance that can be developed fullest through the use of *right* tools. Atkins Saws are *exactly right* . . . in set and keenness of teeth . . . in blade and handle design . . . in ease of handling and cutting accuracy . . . in every way to shorten the way to skill that spells success. *And they're right for your budget, too.* Made of famous "Silver Steel," they have the stamina to stand up under daily school-shop use — ruggedness to resist the roughest handling.

E. C. ATKINS AND COMPANY
Home Office and Factory:
404 S. Illinois St., Indianapolis 9, Indiana
Branch Factory: Portland, Oregon
Atlanta • Chicago • New Orleans • New York • San Francisco

WALLACE
"MACHINE-OF-THE-MONTH"

No. 11
UNIVERSAL SAW

Direct Gear Drive. Motor raises, lowers, tilts — table remains horizontal. Micrometer rip fence for fast set-ups and close work. Two mitre gauges, adjustable for accuracy and wear. Motors to 2 H.P.

Here's a variety saw with value *plus* — a precision unit for accurate work, with extra capacity for those hard-to-handle jobs.

It has power, speed, stamina. Blades up to 11" cut 4" deep. Cross-cutting capacity, 14". Ripping capacity, 12", 24", 36" or 48". Quality materials guarantee long, trouble-free service.

Write today for bulletins. We also manufacture high-grade bandsaws, jointers, cut-off saws, mortisers, lathes, shapers, grinders, etc.

J. D. WALLACE & COMPANY
140 S. CALIFORNIA AVE. CHICAGO, ILL.

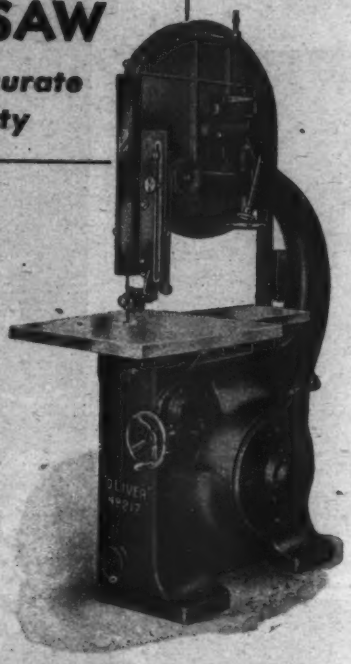
MORGAN VISES

Continuous Screw Vises can be supplied with steel handles at small additional cost.

Morgan Vises have given many years of highly satisfactory service to the nation's school shops. Morgan Vise leadership represents years of manufacturing in high-grade, quality material vises. They cost no more than other vises.

THE
MORGAN
VISE CO.
120 N. Jefferson St. Chicago, Ill.

"OLIVER"
30-INCH BAND SAW
for smooth, accurate work with safety



Supervisors of school shops were quick to recognize the wide range of work this Saw handles. Also its stamina and special safety features.

- Upper wheel has automatic brake
- Shut-off foot brake for lower wheel
- High speed disk wheel mounted on ball bearings
- Self-locking table tilts 45° to right, 10° to left. Tilting device is immersed in oil.
- Dust collecting system
- Heavy-one-piece frame
- New frictionless type saw guides
- *Write for Bulletin 217-D containing full details*

OLIVER MACHINERY CO., Grand Rapids 2, Michigan

1 SCREW DRIVER does the work of 3

MILLERS FALLS
Automatics make teaching easier

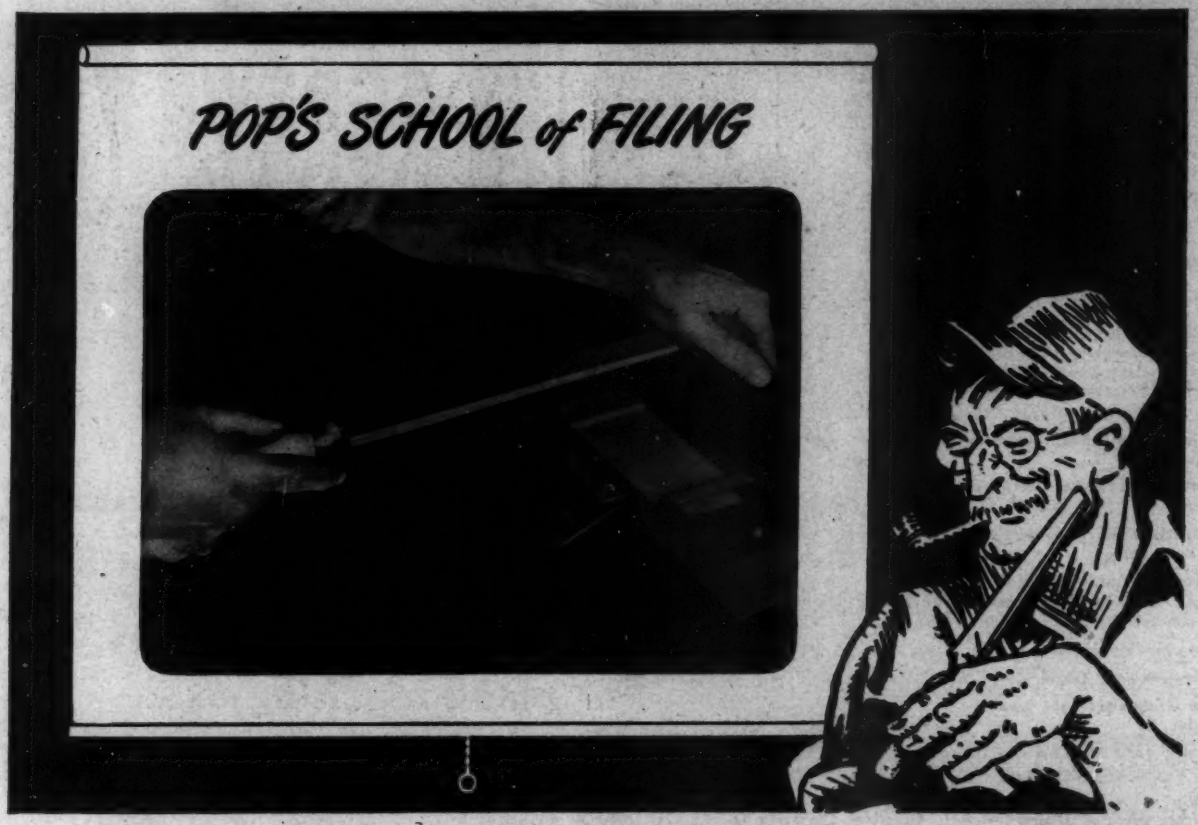
With only one screw driver — a Millers Falls Spiral Ratchet — your students can do *any* screw driving job quickly and easily. Millers Falls Automatics can be used as regular rigid screw drivers, as right-or left-hand ratchets, or as complete automatics, to either drive or draw screws. Changes are made simply by shifting the knurled control sleeve and the spiral lock nut.

Velvet-smooth, powerful action and tested dependability are built into Millers Falls Automatic Screw Drivers. Their wide range of usefulness will make your teaching job many times easier. Ask your supplier to show you these fine Millers Falls tools.

One Thing in Common — *Quality!*

MILLERS FALLS TOOLS SINCE 1868

MILLERS FALLS COMPANY
GREENFIELD, MASSACHUSETTS



"PLAY IT SAFE WHEN FILING A DIE"—says Pop the Foreman

TRAINING school staffs can dispense mighty helpful information to the diemakers of tomorrow from the following:

The exacting requirements of diemaking put an extra-high responsibility on using *The right file for the job.* To guard against irregularities, inaccuracies, or too much metal removal, many operations (as in corners) call for machinists' files with at least one "safe" (uncut) edge. Accurate cut, uniform hardening, absolute straightness are likewise essential. They are scrupulously maintained in Nicholson files. Expert diemakers, by a large majority, choose this world-famous brand.

Action and close-up views show the Nicholson **Hand** with one "safe" edge. A good assortment of machinists' files suitable for general diemaking consists of the following shapes and cuts for "roughing" and finishing:

HAND — *Bastard double cut with one "safe" edge.*
HAND FINISHING—*Smooth double cut with two "safe" edges.*
PILLAR—*Bastard and Smooth double cut with one "safe" edge.*
SQUARE BLUNT — *Bastard double cut.*
ROUND — *Bastard spiral (double) cut.*
HALF ROUND TAPERED — *Bastard double cut back and flat side; Smooth single cut back and double cut flat side.*
THREE SQUARE TAPERED—*Bastard and Smooth double cut.*

And — for small precision dies, the wide variety of Nicholson X.F. Swiss Pattern Die Sinkers Files comprises quite a study in itself. The Nicholson book, *File Filosophy,* discourses at some length on the subject. Have you enough copies for library, shop and classroom needs?

NICHOLSON U.S.A.

NICHOLSON FILE CO. • 47 ACORN STREET, PROVIDENCE 1, R. I.
(In Canada, Port Hope, Ont.)

BLACK DIAMOND TRADE MARK

NICHOLSON FILES *FOR EVERY PURPOSE*

VOL. 36. NO. 4 APRIL, 1947

Industrial Arts and Vocational Education

THE SHOP TEACHERS' PROFESSIONAL MAGAZINE

THE BRUCE PUBLISHING COMPANY | CENTRAL OFFICE: 105 SO. LA SALLE ST., CHICAGO 3, ILL.
540 NO. MILWAUKEE ST., MILWAUKEE 1, WIS. | EASTERN OFFICE: 330 WEST 42ND ST., NEW YORK 18, N.Y.

▶ An Announcement

Much as the publisher of INDUSTRIAL ARTS AND VOCATIONAL EDUCATION hates to do it, the cost of paper and labor make it imperative that the subscription price of this magazine be increased to $3.00 per year.

This increase will go into effect on May 1, 1947.

Current subscriptions, of course, are not affected until the time of their expiration; and until May 1, 1947, renewals and new subscriptions will be entered at the old rate of $2.50 per year.

▶ Coming Conventions

March 20–22. New Jersey Vocational and Arts Association at Asbury Park, N. J. Headquarters, Berkeley-Carteret Hotel. J. J. Berilla, 549 Corliss Ave., Phillipsburg, Pa.

April 3–5. The Texas Vocational Association at Fort Worth, Tex. President, Chris H. Groneman, Texas A. & M. College, College Station, Tex.

April 7–10. New York State Vocational and Practical Arts Association at New York City. Secretary, M. B. Galbreath, Morrisville Technical Institute, Morrisville, N. Y. Headquarters, Hotel Pennsylvania.

April 10–12. Illinois Industrial Education Association at Peoria, Ill. Secretary, Louis V. Newkirk, 228 No. LaSalle St., Chicago, Ill.

April 10–12. Michigan Industrial Education Association at Detroit, Mich. Secretary, Arthur L. Reagh, 143 Bostwick, N.E., Grand Rapids 3, Mich. Headquarters, Cass Technical High School.

April 24–26. American Industrial Arts Association at Columbus, Ohio. Secretary, John J. Hatch, 185 Broadway, Newark 4, N. J. Headquarters, Neil House.

May 12–15. American Association for Adult Education at West Point, N. Y. Secretary, Morse A. Cartwright, 525 West 120th St., New York 27, N. Y. Headquarters, U. S. Thayer Hotel.

June 19–20. Pennsylvania Vocational Association at Eagles Mere, Pa. Secretary, Henry S. Brunner, Dept. of Agricultural Education, State College, State College, Pa. Headquarters, Forest Inn.

▶ This Month's Cover

The photograph used for the April cover was submitted by Warren K. Begeman, director, Technical Education and Industrial Arts, Board of Education, St. Louis, Mo. It shows a student in the machine shop of the Hadley Technical High School, St. Louis, Mo., cutting a gear on a milling machine.

TABLE OF CONTENTS

How to Make a School Shop Layout ..... *Ammon Swope* 141
Rearranging the School Shop .... *Stanley J. Pawelek* and *Howard E. Ziefle* 144
The New Print-Shop Boy ..... *Leonard E. Schmidt* 146
Instructional Methods for Veteran On-the-Job Training. *Von H. Robertson* 147
G. I. Training Versus Civilian Education ..... *J. W. Giachino* 149
Foremanship Training and the Conference Method ..... *H. W. Paine* 152
The Impending Shortage of Construction Workers ..... *S. Lewis Land* 156
Editorials 157
Providing Building and Teaching Facilities for Art Education ..... *Leon L. Winslow* 159

▶ **Testing and Tests**

Final Examination — Mechanical Drawing I. ..... *Anthony Calendar* 163
Test for Drafting Room ..... *W. C. Ford* 164

▶ **Problems and Projects**

Pupil Responsibility ..... *Clarence R. Wood* 165
Design for Wall Shelf ..... *W. Donald Larrick* 166
Sheet-Metal Scoops ..... *Martin Peterson* 166
Indian Silversmithing ..... *Ben. Hunt* 168
A Mark to Shoot At 169
Welded Steel Shop Bench ..... *A. G. Parks* 169
Corners for Cabinetmakers ..... *F. D. Van Volkenburg* 169
Overcoming Handicaps 170
A Unit on the Formula ..... *Francis G. Huss* 170
A Handy Knife ..... *Harry S. Baldwin* 170
Whittling-Jackknife Technique ..... *W. Ben. Hunt* 173
Tile-Top Coffee Table ..... *Thomas H. Roberts* 175
The Assignment, Work Habits, Study Skills ..... *Jerome Leavitt* 176
Welding Terms ..... *George E. Flynn* 177
Fundamentals of Blueprint Reading ..... *C. H. Niemann* 177
A Fabricated C Clamp ..... *Harold A. Oakes* 181

Personal News ..... 182 News Notes 16A
Association News ..... 182 New Publications 21A
Shop Equipment News 22A

Entered January 2, 1914, as Second-Class Mail Matter at Milwaukee, Wis., under Act of March 3, 1879. Copyright, 1947, by the Bruce Publishing Co. Title registered as Trade Mark in U. S. Patent Office, November 25, 1930. Published monthly except during July and August.

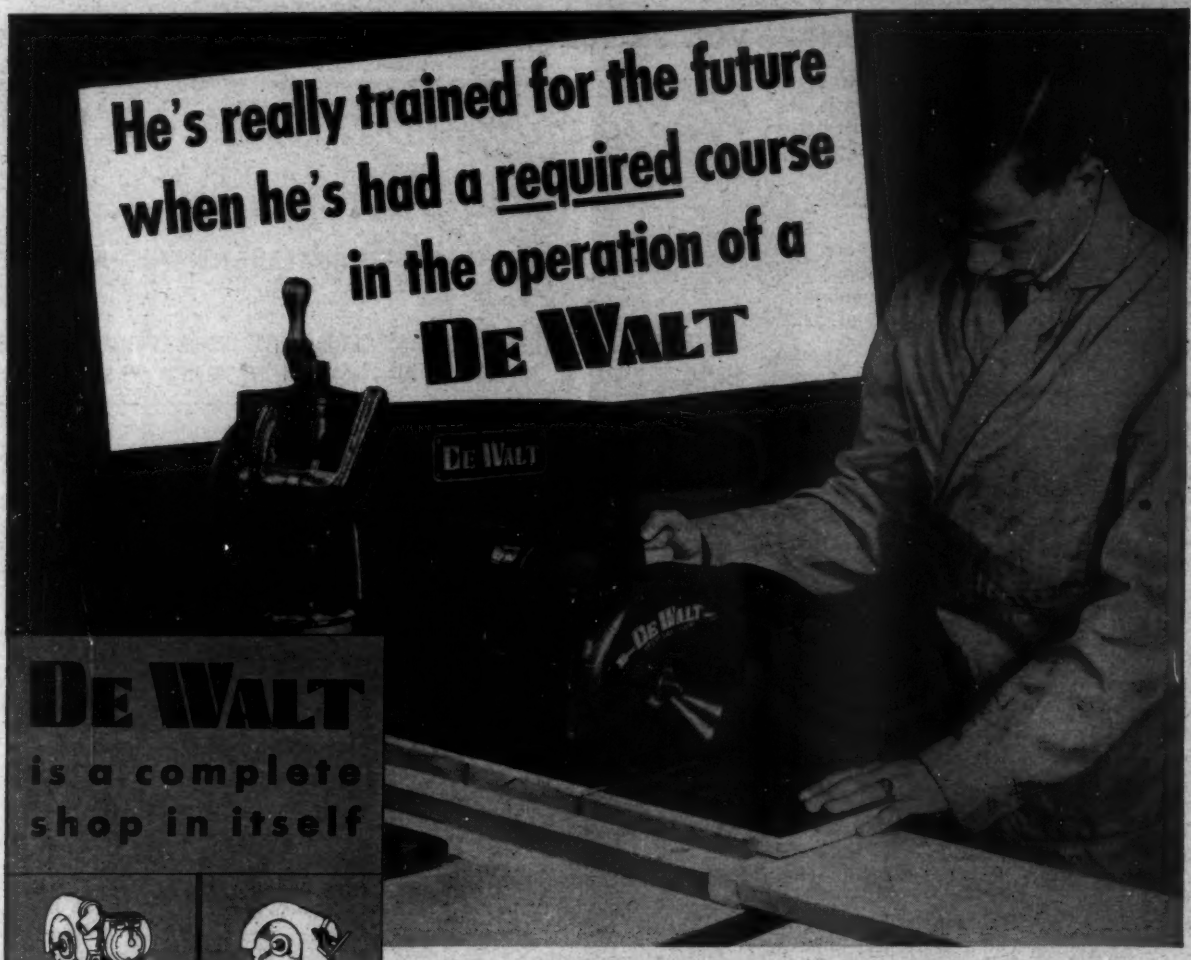
Subscription Information. — Subscription price in the United States, Canada, and countries of the Pan-American Union, $2.50 per year, payable in advance. Postage, foreign countries, 50 cents. Copies not over three months old, 35 cents; more than three months, 50 cents.

Discontinuance. — Notice of discontinuance of subscription must reach the Publication Office in Milwaukee, at least fifteen days before date of expiration. Notices of changes of address should invariably include the old as well as the new address. Complaints of nonreceipt of subscribers' copies cannot be honored unless made within fifteen days after date of issue.

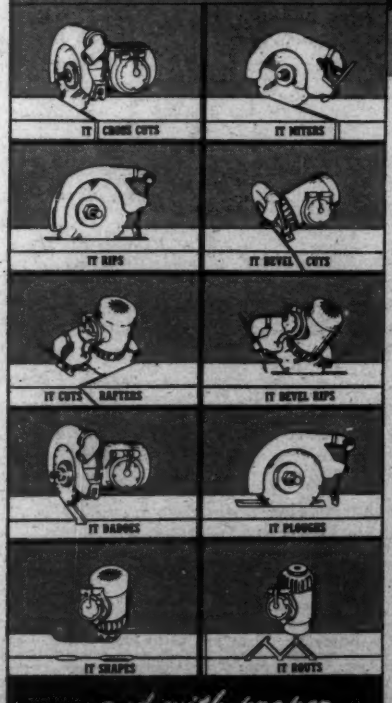
Editorial Contributions. — The Editor invites contributions bearing upon Industrial Arts, Vocational Education, and related subjects. Manuscripts, drawings, projects, news, etc., should be sent to the Publication Office in Milwaukee. Contributions are paid for at regular space rates. In all cases manuscripts should be accompanied by full return postage.

Articles Indexed. — The articles contained in the Magazine are regularly indexed in "The Readers' Guide to Periodical Literature," and "Education Index."

He's really trained for the future when he's had a required course in the operation of a DE WALT



DE WALT is a complete shop in itself



...and with proper tools makes any cut possible!

After the student has completed his basic training course in the use of hand tools, he should have a required course in the operation of DeWalt.

Knowing how to make the fullest use of this flexible, easy-to-operate machine, will give any student a head-start as he prepares for tomorrow's industry.

When he leaves school he will be fully acquainted with a machine that is destined to occupy a prominent place in tomorrow's industry. The perfection of the DeWalt saw has created new methods in cutting wood, making obsolete old-style equipment previously used.

If you are planning new equipment for your training school, don't take a chance on getting a DeWalt from the War Assets Administration—very few are available. Include DeWalt in your budget, and put in your order direct.

Ask a nearby DeWalt dealer about two DeWalt 16MM movies—one showing the general application of DeWalt—the other showing modern, pre-cutting techniques developed during the war. Write for catalog.

DEWALT PRODUCTS CORPORATION

124 Fountain Avenue Lancaster, Penna.

-IAVE-

APRIL 1947

How to Make a School Shop Layout

AMMON SWOPE
Professor, Trade and Industrial Education, and Chairman, Trade and Industrial Extension
Purdue University
Lafayette, Ind.

It is the purpose of this article to set forth the principles that should be used as guides in making a shop layout. It is not intended that specific plans shall be given for different types of shops except by way of illustration. The material is based on statistical analysis made over a period of years by men who are actually using shops of various types. The procedure was to determine first what are to be regarded as important factors in shop planning, working from a suggestive list. This was then given to groups for arrangement in order of preference and importance of the various items submitted. In the material which follows these will be discussed in the order in which one needs to proceed to make the plan. The headings of the subtopics, taken in order, constitute an instruction sheet for shop planning.

Some years ago a noted psychologist, in reviewing the work of his laboratory over a generation, wrote the following interesting statement: "It is impossible to teach a learner directly. All one can do is to provide a favorable environment for learning." Assuming this conclusion to be correct in all phases of learning, and in view of the fact that shop training is direct learning rather than lesson learning, it is important that the shop be arranged in such a way that the objectives for shop instruction shall be fully met.

Name the Types of Courses to Be Offered and State the Objectives of Each

It is important that the objectives of any shop course be clearly stated before an effort is made to lay out a shop for the fulfillment of these objectives. In general, there are two types of shops that are in use today. The first of these is the *unit shop* and is found in many of our technical high schools and vocational programs. It is evident from the name itself that in a unit shop only one subject is taught. This frequently has a technical or vocational emphasis which means, of course, that the shop must be planned in such a way that more extensive equipment be used than in the second type of shop. This second type of shop is the *general shop* and is used pretty generally as an educational device in the junior high school and in some cases in the senior high school and might even in some cases be used for general training in special types of work. The general shop, of course, includes several types of subject matter, all of which may be taught in the same shop room in different areas at the same time and usually under the direction of one teacher. For that reason, since there are independent units, in so far as the subject matter is concerned and combined units in so far as the student is concerned, it is important that the arrangement of the various areas of work follow a well-planned scheme.

Since the limits of this discussion do not permit further treatment of the objectives, it may be said in conclusion that it is important to determine whether the shop is to be used under the unit plan of instruction or the general plan of instruction.

Determine the Size of the Class

There has been a tendency in recent years to augment the size of classes due to the pressure for taking care of larger groups of students and also due to the fact of the increasing interest and importance of shop subjects at all levels. It is safe to say, that in most situations, the class size in vocational teaching, which usually is the unit type of shop, should not exceed 20 in number in a day trade school, whereas in the general shop, the size of the class frequently has been set at 25 or 30, depending largely on the administrative attitude in regard to class size. Let us assume for purpose of study here, that in no case should the class size be greater than that of allowing six pupils to one area and not over four areas in a general shop. This allows for reasonable attention on the part of the teacher in any situation.

Outside of the graphic arts, including drawing and printing, there are four areas which will, in most cases, be satisfactory for the general shop plan. They are *wood*, which is a traditional subject and which furnishes a ready medium for expression on the part of the student; *power* which in this period will more than likely be electricity in its elementary implications; *metal* which may have a number of ramifications, such as art metal, sheet metal, metal spinning, cold metalwork; and *ceramics* which, added to the others, gives a rather complete picture from the standpoint of guidance when taught in connection with them.

Determine the Areas to Be Used for Shop Space

There are two lines of approach here. If a building is to be replanned or reconditioned, it is probable that space which is already available will have to be used for teaching one or more of the shops mentioned in the foregoing. If the shop is to be an integral part of a new structure, then it is much more satisfactory to make suggestions whereby the shop layout can be drawn up in the architect's plan with necessary conveniences.

Let us first give attention to the replanning of space which may or may not have been used for shopwork. It is necessary first of all to reduce the plan to an exact drawing. In order to do this, overall dimensions are necessary and on these must be located any position that has some permanent fixture such as walls, doorways, windows, stairs, outlets and others. The actual working area will, as can be seen later, usually fit into these positions if the procedure outlined here is followed. In addition to drawing a plan locating positions as herein mentioned, it is worth the

time to draw all elevations showing heights and widths of various fixed areas. It is important, for example, to know whether a machine will stand under a window or in front of it. It is necessary also to know the height of a power outlet as well as other items of this type. Then too, if one wishes to design hanging cabinets for tools or supplies, it is equally important to be able to find positions for support. All these may be given in the elevation. Another interesting example, of course, as will be seen later, is the station for the teacher, showing his position in such a way that he will always be able to see what is going on in the room.

Determine the Equipment to Be Placed

If a unit shop is to be planned, the objectives of the course which may be vocational or technical, but in any case are well established, there may be rules of procedure which are characteristic of the material or the equipment to be used. An example of this would be in the case of welding. If booths are to be located along the walls for arc welding, it is necessary that the table where the welding is done be shielded and yet that there be adequate amount of air, space, and light when necessary. It is not evident from the practice of welding instructors whether the generator should be placed inside the booth or outside. For purposes of inspection, it is perhaps much better outside the booth. This again would have something to do with the type of booth and the size of area used for a particular booth. Other illustrations may be found in similar fields in the unit shop, as for an example, in the machine shop, a milling machine used in vocational teaching, if placed in front of other equipment, may cut off the view to that particular area of the shop. The writer observed in a rather up-to-date shop not long ago, that the teacher's station was farthest from the door and when he was sitting at his desk, a milling machine stood directly in front of him, so that, at the time of making out records or other duties of that type, he was completely cut off from the rest of the shop so far as vision was concerned.

If one considers the general shop, it is of course necessary that he give thought not only to the objectives of the course, but to the actual projects that are to be made to fullfill these objectives. Frequently the instructor needs equipment which is used for preparation of materials but which students do not use. This must be shown in the list of equipment even though it is not for student use. Then too, in addition to equipment, it should be mentioned that supplies consume space in the general shop area in such a way that they obstruct both the vision of the teacher and the general activities of the students in the shop. One should say in conclusion then that it is necessary to make a complete list of equipment with sizes of such equipment and necessary storage space for supplies before the attempt is made to lay out the plan and elevation.

Determine the Floor Area for Various Types of Equipment and Supplies

Many tool catalogs give at least three dimensions for the space occupied by equipment described in them. This, however, is not all that is necessary in a determination of area. The actual working area is of equal importance. In order to determine the working area, several methods may be used. One is the actual determination of the space used while a workman is performing at the machine. It is usually well to observe this space when the workingman is not conscious of being observed. Check outside limits on the floor and from this determine the working areas and position of the working areas around the machine. The second need is to determine the floor area required for making necessary inspections for maintenance of the machine, or when it must be taken out of service for repairs. There are other items, of course, that frequently may be overlooked. A serious accident might be caused in machine shops if the ram on a shaper is set in such a way, that while it clears the wall in its back and forth motion, it would not clear the passage of a person or material between itself and the wall. This, of course, could lead to a serious casualty. Therefore, one needs to include in this the idea of a moving part constituting the working area.

Let us assume then that we have adopted a working scale. A satisfactory scale for original layout is ¼ inch to 1 foot. Much of this can be done by sketching on cross-section paper of that scale without any elaborate drawings. He may take this same type of paper and cut out the working areas of any single piece of equipment. It is well, therefore, to begin by drawing the machine area itself and then on the same scale draw the work areas around the machine. These cutouts can then be used for making the shop layout as will be seen in later paragraphs.

Make the Final Layout

We are now ready for the final layout. This is made in terms of the objectives previously determined.

All students should enter at one point; except in unusual cases it is possible to have the major lane lead from the entrance to the other side of the room with lanes running to appropriate places between work areas as already indicated. This major lane, depending largely on the type of shop, should be, in most cases, at least four feet wide and be bounded by lines painted on the floor in color. Each line should be drawn continuous with some other line at an intersecting point. An older plan was to describe safety work areas about a machine and thus protect the worker while at his work station. This has the disadvantage of allowing the free circulation of students in areas other than the one in which he is working and creates a situation in which the conduct of the student is brought into question. In such subjects as drawing, it is frequently found that where there are rows of desks it is necessary at certain intervals to establish a wide lane rather than equal distances between each desk or work station.

A reason for modification of the layout is usually found in the situation in which artificial or natural light is the determining factor as to the usefulness of any given work station or work area. In the case of woodworking, for example, a student who works at a vise next to a window will need to have the bench turned in such a way that the light will fall on the point of his work. This is equally true in such subjects as machine shop where the light falls on the point of the tool from the window. It is frequently desirable that instead of machines or benches being set at right angles to the wall, they should be set at some other angle. For example, in the case of a lathe, the headstock of the lathe would be toward the wall with the student facing the light at some convenient angle of perhaps 30 to 45 degrees from the perpendicular to the wall. This can easily be determined by experimentation. The lighting situation frequently determines also the location of tool and supply cabinets. When artificial light is used, the problem of installation of the light frequently becomes the determining factor in the location of benches. In the modern fluorescent type of lighting which may be controlled from two switches throwing on alternate lights, it is found better to arrange the fixture in such a way that the tube of light crosses the work area. In the installation of the power line, both in lighting and for equipment power supply, it is important that previous planning be done of the work areas before the final determination of the lighting. Practically all machines are now driven by individual motors. The line shaft problem does not in any way interfere with the overhead lighting. Since this article is not concerning lighting, it is sufficient to say here that

the necessary amount of light should be obtained by fixtures which are relatively high, thus giving well diffused light. Many teachers, of course, prefer individual lighting in addition to the centrally located lights.

In addition to this, in case the installation is new, it is well to hold conferences with the architect and have the lighting situation fully determined prior to the building of the structure.

In the layout of the power lines, three plans are used. One and perhaps the least desirable is the floor outlet which can be used for portable machines at different places. This has not been found to be satisfactory due to moisture conditions frequently found in many of the shops, or the general tendency to use concrete base floors which makes it impossible to make the necessary changes except at maximum costs.

The second type or the overhead, sometimes known as industrial type, has many advantages and none of the disadvantages found in the floor type mentioned before. This type of course can be easily adjusted if necessary to meet the conditions of the shop layout. It is entirely possible to drop the necessary lines to the machines as needed, and in addition necessary outlets for portable machines may be located at some reasonable height, usually above six feet where such machines are likely to be used.

The third type and one which can be easily installed is that of a line of outlets around the entire room, making it possible to plug in for various types of portable machines. It has the disadvantage also of cluttering up space which might be used for other purposes and increasing the hazard both to the equipment and to the pupils.

There are other factors to be considered in establishing the areas and lines of travel. These areas provided for in the lines of travel which are safety precautions must be placed in such a position that it will not be necessary to use them for work space. An unfailing rule of any teacher should be to keep the lines of travel clear.

With regard to the location of certain types of equipment, it is clear that the most used general equipment in any shop, for example a drill press or grinding stand should be in such location that it should take the least amount of travel to be reached by all students. This means a location in some central position. In contrast with this, we find that many instructors place these much used tools in out of the way places or corners where students congregate and disciplinary troubles begin as a consequence.

Meet the Legal Requirements

Each state has its own building codes which must be followed. These can be easily obtained by writing to the State Department of Public Instruction or other agencies that have to do with child labor laws, workmen's compensation, and others that give attention to the health and safety of workers. There are many suggestions, recommendations, and requirements that the instructor must give careful thought to in planning a shop in addition to the legal requirements. It is obvious that if one wishes to have a shop that appears well, it must be systematically designed. Machines must show some thought in arrangement. The lines of travel must be generous and lead somewhere. The open floor areas must be used for a given purpose and for no other. The blackboards and bulletin boards must be in such positions as to be available. The seating arrangement, which may be temporary or permanent, must be planned in advance in terms of the objectives. If as in a vocational situation, related subjects instruction is to be given in the proximity of the shop, the general scheme of layout must be considered in terms of teaching such related material. The teacher must have opportunity to stand in the correct position in case he is giving individual demonstrations. Machines must be arranged in such a way that he will be able to inspect machine or work, while the student is at his station.

Very little has been said about total floor area. The entire problem is determined again to some extent by state regulations. A typical classroom in high school will range in width, according to most state requirements, from 20 to 25 ft., with the plan for artificial lighting determined by legal requirements. The elevations are also set up in most states. It is therefore necessary to determine the total area of a shop space which is to be used, for instance, for a general shop in connection with general courses and to plan in such way that two rooms may be used as a single unit or thrown together in an architect's plan with the hallway becoming a part of the unit. In such cases it would be easy to plan a room on the end of a wing which might be 50 ft. in width and any required length. For a general shop a length of 40 to 60 ft. would make a satisfactory room.

In the unit vocational shop since frequently the wings are thrown off from the main hallway and have an entrance at the end of the wing for trucks and other carrying and loading devices, the room may be built any required width. Again the total area of the room, with reasonable allowances for safety factors and necessary expansion may be determined by plotting the plan as suggested in the foregoing, using the necessary cutouts to determine the required working area. One should not overlook the possibility of the space being used for other purposes in the near future as objectives may change in many situations. It is well always to have on file a complete and authorized layout for the shop which may be used with local school officials or with state or federal officials when there is a possibility of the replanning of the room for purposes of securing additional funds or new equipment. Such planning makes it possible to meet legal requirements in a satisfactory manner.

SOMETHING TO THINK ABOUT

The following news notes are taken from *Safety News* published by the National Safety Council.

If the present rate of traffic fatalities continues, 38,000 persons will be killed this year.

Three out of four accidental deaths to children under 5 years occur in the home.

Beginning in May, and continuing through August, 1000 persons lose their lives each month through drownings in the United States.

In January and February, a total of 5450 persons were killed in traffic accidents. This is more than 45 per cent above the number killed in the same months of 1945.

Spring cleaning was just about through
And what in the world did Jane do?
Why, with balance uncertain
She reached for a curtain
And pulled down a life impromptu.

Injuries to farm people totaled 1,500,000 in one year.

Preventable accidents take a life every five and one-half minutes of the day.

There is increased need for decreased speed!

Epitaphs for speeders: "He was just dying to see how fast he could drive. . . . He died with his boots on the accelerator."

Famous last words: "Hand me a stack of books to stand on, then I can reach it."

The April traffic death toll reached 2650 — a 47 per cent increase over April of last year, and 1 per cent more than the same month of 1941, America's most deadly traffic year.

It isn't the right of way that counts — it's the right way.

Home accidents took the greatest farm toll last year with 6500 deaths as compared to 6000 in 1944.

Doubling your speed means: (1) twice the thinking distance before you start to stop; (2) four times the braking distance before you stop; (3) four times the force of collision if you can't stop!

Rearranging The School Shop

STANLEY J. PAWELEK and HOWARD E. ZIEFLE
Supervisors of Industrial Education
Baltimore, Maryland

Relatively speaking, only a small number of shopwork teachers have ever been fortunate enough to design, equip, arrange, and organize school shops "from scratch." Those whose privilege it has been to number this among their experiences are to be envied indeed. For many teachers it is difficult even to imagine being in a position to follow all the rules of good shop design and layout. To have the opportunity to plan for adequate floor space, just the right height for ceilings, ample storage space, plenty of electrical and other service outlets, seating space for students, blackboards, bulletin boards, good tool storage facilities, healthful ventilation, light and heat, beautiful color harmony, and an office for the teacher, is something simply out "of this world." They often read and hear about such extravagances, but never experience them. To them this is only a dream! Their lot becomes not one of creativeness but of ingenuity for doing the best they can with what they have. They cannot "push out the walls" nor perform other equally impossible miracles. They must be content to rearrange, rebuild, repaint, and reorganize. Their efforts are focused in the direction of improvement for better instruction, better appearance, and safer places in which to work. The results may fall far short of the ideals generally set up in many listings of standards for school shops, but if they have done all that is possible in their own situations, they merit applause and approbation. On the other hand, a shop that is designed according to accepted standards of size, shape, light, ventilation, and heat may be found lacking if the teacher does not have the ingenuity and ability to arrange it attractively, and from the point of view of safety and efficiency of teaching and learning. So it would appear that a knowledge of some basic principles of arrangement is essential in any type of shop — new or old, to have it well designed or adapted from an ordinary classroom.

Our literature abounds with information needed for planning school shops. Floor plans showing correct placement of furniture and equipment are numerous. Much printed material is to be found showing beautifully arranged tool panels, bulletin boards, and other factors which are taken into consideration in contemplated arrangements. It is the purpose of this article, however, to set up certain principles which can be applied in rearranging school shops so that they become attractive, safe, and educationally effective. They cannot be made so by mere whims or guesses. It is not enough to change things about unless the change is made with definite objectives in mind and according to definite principles. Many a housewife becomes tired of looking at her furniture arranged in the same old way over a period of time and finally decides to move things around. After wrestling with chairs, sofas, tables, rugs and even the piano, she sits, exhausted, surveying the fruits of her labor. The realization suddenly dawns upon her that the way things were originally was much better, and so she proceeds to move everything back again, or waits for her husband to come home to do the job. This is not recommended as an efficient course for the shop teacher to take. He should know in advance what the results will be because he has planned it that way. Shop furniture and equipment are not easily moved. It is better to make scaled templates of everything movable and place these on a floor plan so that the entire scheme can be observed and changed before any heavy work is done. Even with such a device the job cannot be satisfactory without a thorough knowledge of some basic principles applicable to any situation. The writers have seen some rearrangements which left much to be desired even though the preliminary planning was done meticulously.

The principles of rearrangement emerge out of *reasons* for the rearrangement, of which, in the final analysis, there are only three. The teacher realizes that his shop is either unsuited for the most effective instruction, or it is not an entirely safe place in which to work, or it is not as attractive to the eye as it could be. There is a fourth reason, too, but it is not an entirely defensible one — he is simply tired of the old arrangement and wants a change. The first three listed are rather closely correlated. By that is meant that a shop which is well arranged for efficient instruction is usually a safe shop as well as an attractive shop. Efficiency of instruction

A crowded shop in which the teacher's job is different. It cannot easily be rearranged except by scheduling small classes only

This shop is much too small for the equipment that must be placed into it

A well arranged shop is not only attractive and safe, but also one in which efficient teaching and learning can take place

Plenty of space in a shop permits an arrangement such as this one

is the prime consideration in making changes even though the other reasons are of major importance. The factors of safety and aesthetic appearance do not *just happen*, but must be planned along with the others. It is usually true, too, that a safe shop and an attractive shop is a good shop in which to teach and, more important, to learn. The three reasons, therefore, supplement one another, and must be considered together, not individually. The following principles, when applied intelligently, will assist materially at arriving at the kind of arrangement requiring no apologies:

Principle I. — The school shop should be arranged in a manner which permits the teacher to teach most efficiently, and the students to learn most effectively.

Principle II. — The school shop should be arranged so that it is a *safe* place to work for both the teacher and students.

Principle III. — The school shop should be arranged so that it presents a pleasing and artistic appearance.

It is to be taken for granted at the outset that the application of the principles to certain factors is difficult, if not impossible. If, for example, the room is square instead of rectangular, or if the ceilings are unusually low or unusually high, and if windows are small and few in number, there is very little that can be done in the way of changes. There are many shops which were not intended for shopwork in the original plans. In many instances they were ordinary classrooms, or even made-over coalbins or storage rooms in basements. Whatever can be done in such cases is not enough — and seldom will be. It is feared that this presentation will appear to be of little value to teachers who inherited such shops. And yet the principles can be applied, within limits, and they can be made as *effective, safe,* and *attractive* as it is humanly possible to make them. All is not entirely hopeless. It is amazing how much can be done to alleviate dinginess, overcrowdedness, and general unsuitability through intelligent planning and rearranging.

For the purpose of delimitation and better understanding, the following factors are those which are rigidly set, and about which little or nothing can be done. They do, however, determine the extent to which rearrangements can be made and thus merit inclusion here: (1) amount of floor space, (2) shape of room, (3) height of ceiling, (4) location in building, (5) number and size of windows, (6) number and size of doors, (7) number and size of closets or storage rooms, (8) type of floor, (9) amount of natural light, (10) ventilation, (11) heat, (12) amount of wall space.

Conversely, there are certain *variable* factors which permit the application of the principles listed, and which can be altered without *major* building or room changes: (1) furniture — workbenches, tables, teacher's desk, etc., (2) heavy equipment, (3) light equipment, (4) seats for students, (5) tool storage, (6) supply storage, (7) bulletin boards, (8) blackboards, (9) display panels and cabinets, (10) color of walls and ceilings, (11) condition of floor, (12 artificial light, (13) "wash-up" facilities, (14) electrical outlets, (15) heat and ventilation (limited control), (16) first-aid facilities, (17) fire extinguishers, (18) containers for inflammable materials, (19) trash and waste facilities, (20) exits for fumes and gases, (21) color of equipment and furniture, (22) gas outlets, (23) students' lockers for clothes and unfinished jobs, (24) library facilities, (25) instructional materials storage.

The application of the principles then becomes a matter of planning and arranging these variable factors into a combination which makes for the maximum of efficiency of instruction, safety, and attractiveness. The following specific recommendations will assist the teacher in making such combinations:

1. In a small shop, look for the things that can be removed without impairing the effectiveness of instruction, and yet make it a safer and a better appearing place.

a) Seats for students are very desirable, yet they are used so little, relatively speaking, that they can be removed, providing more room for workbenches and equipment. Students may sit on the benches or even stand for brief lessons and demonstrations. Bleachers can be built to replace seats, and take up much less space.

b) Toolrooms can be changed over into storage rooms for supplies and be supplanted by flat tool panels or cabinets built in some convenient place on the wall of the shop.

c) The teacher's desk which takes up valuable space can be removed and replaced by a small table or an individual workbench with drawers which can be used by students during work periods and also by the teacher as a desk.

d) If possible, remove large machines and replace with smaller bench-type models.

e) Large stock racks can often be removed to some other place in the building and be replaced with small ones which are kept filled with stock for immediate use only. In many instances, stock can be kept in racks built under workbenches and other rarely used space.

f) Individual workbenches are ideal but they take up much more space than the multiple work station type, and should be replaced if possible. Some woodshops use

the six-vise 2 by 9-ft. workbenches and save much space.

g) Equipment which is very rarely used may be removed from the shop into another room or large closet where it can be used when necessary but does not "clog up" the shop. This is often done with squaring shears in junior high school sheet-metal shops.

2. Make use of all recessed spaces in the shop. Some teachers build tool panels and cabinets in them. Others use them for certain machines, such as drill presses. Still others utilize the space for display panels or cases.

3. Adequate aisle space is a very important factor in making the application of the three principles functional. The appearance is improved, instruction becomes more efficient and the shop is certainly a safer place. Students are not continually colliding with each other causing discipline problems. They can move about more freely in using equipment and other work stations. The appearance is not one of congestion and overcrowding. An open space where larger jobs may be assembled is also a very desirable adjunct.

4. When placing or rearranging equipment such as large machines, be sure that they are arranged in an ascending order of height from the front of the room to the back. Such an arrangement permits an unobstructed view throughout the entire room, and presents a much more pleasing appearance to an observer. It also prevents discipline problems caused by clever students who hide behind tall machines and engage in some undesirable activities.

5. Keep machines and workbenches lined up in straight lines in so far as possible. Thoughtlessness in this matter causes not only a ragged appearance but also accidents through students' collisions with protruding equipment.

6. Utilize natural light as much as possible in the placement of machines and work stations. Be sure to eliminate shadows especially at work stations where precision work is to be done.

7. Locate tool cabinets, tool panels, or toolrooms as centrally as possible, and provide plenty of open space around them. This will eliminate *bottlenecking*, discipline problems, and undue delays at the time when the majority of the class is attempting to secure tools for the period's work.

8. Paint walls and ceilings in light colors to make the room as bright and cheerful as possible. Much can be done in the way of improving the appearance of a shop through a judicious use of color on machines and other equipment. Industry makes extended use of *color dynamics*. Bright colors such as yellow, red, or orange should be used very sparingly and only for emphasis of safety hazards.

9. Blackboards are very important teaching aids in a shop. If permanent blackboards are not available, make use of portable ones — but *have* them and use them intelligently.

10. Bulletin boards with attractively arranged, well-placed display material which is changed often, not only help to make instruction better but also add to the appearance of the shop.

11. Utilize *nooks and crannies* for attractive shelves and whatnots for the display of a few well-designed and well-constructed articles.

12. Remember that *all display is no display*. A shop in which the walls are practically papered with posters, charts, and drawings is not an attractive shop. It is better to have just a few such items, strategically placed and artistically displayed.

13. Place your first-aid cabinet where it is readily accessible and do not keep it locked.

14. Wherever possible place machines which are ordinarily used in a sequential order in the order in which they are used and near each other. (Example: circular saw, jointer, sander.)

15. Avoid, studiously, all fire hazards and hazards to life and limb. Do not, for example, have sheet-metal stakes protruding out into an aisle, or store inflammable materials in wooden cabinets or closets.

16. Place demonstration tables and equipment in a position which permits students to observe and listen effectively.

17. Paint safety zones around dangerous machinery.

18. Arrange to have generous open spaces near entrances and exits. This will tend to eliminate congestion on the part of the students, and give a feeling of ample elbow room to those who come to visit or observe.

19. When the floor space of the shop permits, it is an excellent plan to provide seating space for students where demonstrations, working out of lessons, and discussions may take place while students are seated. Tablet arm chairs, bleachers, or ordinary classroom desks may be used. Some ingenious teachers have devised counterbalanced bleachers which can be raised so that they are out of the way when they are not in use.

20. Provide adequate storage space for students' unfinished work. Recessed lockers are to be preferred but there are many other devices used by teachers. Individual drawers under workbenches or cabinets built under them can also serve the purpose. Whatever plan is used is much better than a total lack of such facilities. However, the scheme wherein students take unfinished work to their own lockers out in the halls of the school has very little to recommend it.

21. It is always well to have a table upon which planning may be done. A drafting table equipped with drafting instruments, if available, provides a very handy work station. When the shop is too small to accommodate it, use a large drafting board hinged to the wall. When not in use it may be dropped down and no space is wasted.

The foregoing are only a few of the recommendations that could be made. Space does not permit a further listing. In conclusion it must be said that one of the worst conditions existing in school shops today is overcrowding. Thirty or more students are often sent to shops in which the available space and equipment can accommodate only twenty. No amount of physical rearranging can remedy such conditions. The one solution is to convince principals and other administrators that teaching and learning cannot take place if the shop is literally bulging with humanity. This requires another type of rearrangement. It would seem, however, that if the teacher has done all that is possible to follow the suggestions given in the foregoing, he will be in a more strategic position to urge upon his administrative officers the construction of schedules that permit smaller classes and more effective instruction.

THE NEW PRINT-SHOP BOY

Leonard E. Schmidt*

A new boy came into the shop today,
They say he's not too bright,
And the only thing that he's good at
Is starting up a fight.

You'll have to watch him closely,
It said upon the note,
So I looked him over carefully
As he hung up his coat.

He took his place like all the rest,
With his case up on the frame,
And "gosh" he was a happy kid
When I let him set his name.

I asked him how he liked the work
When the period was through,
And he told me, "For the first time,
I've found something I like to do."

Perhaps I'll be "let down" by Bill,
It's happened to me before;
But I go for a boy who really tries,
And I never ask for more.

*Lincolndale, N. Y.

Instructional Methods For Veteran On-The-Job Training*

VON H. ROBERTSON
State Supervisor
Trade and Industrial Education
Salt Lake City, Utah

Much has been said in conferences and bulletins about adjusting instructional methods to on-the-job training for veterans, and of the necessity for using special techniques and new devices to meet their special needs. Supervisors in the field have sent in worried requests for aids, plans, and courses adapted to the unique problems of G.I. training and have attempted in some cases to rewrite the teaching program. I do not believe that we need to adjust our methods of instruction to veteran training. We need only to apply the methods we should always be using in the trade instructional program. I make this statement on the assumption that the G.I.'s in on-the-job and related training are no different than any other adult trainees.

From a survey made of approximately 5000 army air force dischargees, and coordinated by Harry H. Ransom, education editor of *Air Force* magazine, as summarized in *Education Digest* for April, 1946, it appears conclusive that the cross section of veterans in the air forces compare quite closely to a cross section of average adult vocational trainees. Mr. Ransom found that 95 per cent of 3200 veterans questioned on the subject of *education for jobs* answered that they had specific training in mind and they indicated the kind of training they wanted. On the question of *education for citizenship*, of 4712 veterans questioned, only 2 per cent expressed no interest in citizenship training. On the subject of *education for enjoyment*, of 5000 veterans questioned, nearly 4000 listed training of more than one kind, among which there was a definite trend toward education for enjoyment of leisure time.

The comment is made that in these categories at least the veterans' ideas on education were no different than the ideas the rest of us profess. We wanted training to enable us to provide for our families; we wanted education that would help us to understand and live with our neighbors; and we wanted music, art, literature, sports, and recreation to make our leisure time more enjoyable. These things the veterans want. Those of us who think we have some of these things, secured them through the regular channels of work experience and education. No special methods were provided for us but in many instances the fundamental principles and methods of trade and industrial education were applied well enough in our behalfs that we were able to shorten the road to employability.

The boys now in on-the-job training would like the same opportunities some of us had. They are entitled to receive from us the same application of industrial training techniques that were most successfully applied by our instructors. They should be served by the best developments of audio-visual education the war has brought out, and assisted through all the short cuts developed by war training that apply to their courses.

But these are not new methods or special techniques. They are better applications of the old and tried methods that have always been good.

Mr. Ransom made ten suggestions with regard to G.I. training as a result of the surveys conducted by the *Air Force* magazine. I want to quote from these suggestions for the implications they have as to instruction plans and devices:

1. Any educational program for veterans should be community wide, assuring correlation of activities and exchange of ideas for the common good, judged realistically in the experience of the particular community. Following the "Goosecreek Plan" or any other ready-made system is likely to mean failure.

2. The program should be subject to continuous inventory based on the changing needs of the veterans.

3. Veterans themselves should participate actively in the program.

4. In many cases, established regulations should be adapted to fit the veteran. This is particularly true of students who do not seek formal academic credit, diplomas, and degrees.

5. Less attention should be paid to teaching methods than to the suitability of the materials presented. If possible, members of the community, under the direction of professional teachers, should be drawn into the program as supplementary instructors.

6. Delays should be eliminated. Promptness in answering inquiries, getting new programs under way, and introducing new methods is essential.

7. Partisan politics, narrow doctrines, and special interest should be rigorously excluded.

8. Problems of economic conflict and racial minorities need not be confronted if the community prefers to ignore them; but they should be eliminated from discussion honestly, and not side-stepped.

9. False uplift and vapid morale building should be shunned as regularly as impractical advice and impossible promises.

10. Ninety per cent of the time the veteran's problem is that of any other adult and should be treated so. When it is a problem peculiar to his status as a veteran, only expert help will solve it.

These conclusions would indicate that no adaptation of methods of instruction need be applied in the veteran training program, either on the job or in the classroom. They do indicate conclusively, however, that vocational education methods must be used adequately inasmuch as the veterans are anxious to get on with their job preparation and are acutely conscious of digression, bumbling, and delay in the presentation of either subject-matter or skill-training experience.

How can the methods of instruction be practiced more intelligently by instructors? There are only three fundamental ways of learning. These are, as Professor Harold J. Clark of Teachers College, Columbia University, points out: learning from direct experience, learning from other people, and learning from books or printed material. According to Professor Clark, it is best to learn some things by direct experience and when direct experience is impossible, to learn them from other people. He indicates that learning from books or printed material is too often the most used way, but the least effective. Learning from direct experience is what the G.I.'s are doing in on-the-job training. This is being supplemented with learning from other people and from printed materials in the related instruction courses. And let me sound a note of warning here that we had better learn mostly from people in our related instruction. In too many cases the text-

*Address delivered before the Trades and Industries Section of the Utah Vocational Association.

books do not apply beyond the stage of laying down principles. The ones that apply principles to today's problems either have not yet been written or have not been put into our hands. On-the-job training must be given under the direction of competent individuals, and the related training must be given by persons qualified by experience and education in the subjects they are to teach.

Probably 90 per cent of the training given to veterans in vocational fields will come through on-the-job experience, which means that they will learn by direct contact with the work, under the supervision of on-the-job instructors. The responsibility of vocational education leadership is that of assisting the on-the-job instructors to apply methods and techniques that will intensify job experience, and direct and supervise the related instruction given in the vocational schools so that it will be harmonious with and functional to the job experience and the daily lives of the veterans. Some of the assistance to be given on-the-job trainers might be:

1. Developing the correct techniques of demonstrating, which include methods of job breakdown and techniques of telling and showing.

2. Understanding and using the best methods of giving technical information; such as using blueprints and charts; using formulas and computation; reading technical data and using precision measuring devices.

3. Using effective methods of checking on previous experience or training and of asking why, what, when, where, and how questions.

4. Developing the techniques used in planning training experience. This means planning an orderly arrangement of learning processes so that the trainee's advancement comes in a chain of co-ordinated new experiences rather than an unorganized exposure to a multitude of seemingly unrelated operations and processes.

The on-the-job trainer should be given assistance also in the techniques of friendly and co-operative supervision of the learner. He should understand something of the necessity for readiness to learn; of limiting the amount to be learned at one time to the ability of the learner to grasp; of the need for continuity of learning experiences; of going from the known to the unknown; and of the necessity for follow-up in the training to insure correct and safe skills and work habits.

These are not adaptations of instructional methods to the veteran program, but the application of known correct teaching techniques to on-the-job training.

The instructor of related subjects needs, in addition to the fundamental techniques of teaching used by the on-the-job trainer, a thorough understanding of adult training problems as implied in the ten suggestions of Mr. Ransom of *Air Force* magazine, particularly the last five. Your attention is recalled to the first part of suggestion number five: Less attention should be paid to teaching methods than to the suitability of the materials presented — which implies that before we can teach successfully, we must determine the needs of those we presume to teach. The second part of suggestion number 5 directs us to have the veterans learn from other people. The related instructor in on-the-job training might almost take Mr. Ransom's suggestions as their ten commandments for effective teaching. These are the application of vocational education methods.

Local directors, employers, and veteran training officers in Utah are now receiving, or will soon receive, lists of suggested study programs planned to meet the related training requirements of G.I. courses in the various occupations. These are based on a wide sampling and consolidation of related study programs on the training plans sent in by the field representatives of the schools who have set up on-the-job training courses. They include specific college subjects such as bookkeeping, salesmanship, mathematics, physics, engineering, and so on, which may be taken in regular or extension classes in the colleges and junior colleges of the state. They include also basic, but more general training courses in several fields, applicable to those veterans who have not had, or who do not desire collegiate experience. These are courses such as related English, basic mathematics, related science, etc. Outlines in these general subjects have been prepared and suggested methods listed for handling them. These also will soon be in the hands of related instruction teachers. Only outlines have been prepared in these general courses, since it is believed that each instructor with each group of veterans will need to select and develop his own subject matter according to the needs and interests to be met for his locality.

The suggested methods in these general courses follow the philosophy indicated in the summary of the Regent's Report of the survey of the schools of New York — "The systematically organized subjects are an aid to the learning of an expert. They are a handicap to the learning of the ordinary person." For instance, in related English, the course should be taught largely by oral instruction, using activities designed to stimulate clear thinking, good diction, and correct pronunciation. These activities might include the dramatization of such common life situations as applying for a job, asking for a raise, conducting an interview, taking charge of a meeting, and such exercises as writing letters, preparing reports and minutes, and directing committees.

With regard to social studies, I quote

Industrial-arts laboratory, Chicago Public Schools. Dr. Louis V. Newkirk, Director, Bureau of Industrial Arts

from the Ohio State University bulletin, Secondary Education for Veterans of World War II, "Veterans are much concerned about values, but they have seen and experienced too much of the sordid or tragic to be taken in by the superficial and censored accounts often considered appropriate social studies materials. . . . Teachers need to show them that men and women who have no illusions about the evils they face still have the faith to fight for what they believed, and have often won the battles in other generations and in ours. To get over the sense of futility about ideals, students need contact with information about the citizens and organizations who work practically toward the fundamental values. . . . Veterans are impatient with the slowness and divisions of democracy. . . . Social studies teachers can make their biggest contribution if they can help them understand the processes by which democracy handles differences of opinion and the ways of accelerating democratic processes without destroying the democracy. . . . Veterans have no illusions. They want to know. They do not want ready-made answers . . . they will not tolerate a teacher who demands that they agree with his conclusions, but they will rise to the challenge of one who demands that they think clearly."

In the teaching of mathematics, there should be, after review of fundamental processes, opportunities to work on the problems of their daily life and work — the arithmetic needed to make a family budget, the computation of taxes, the methods of computing interest, insurance, depreciation, etc., and of course, the mathematics of their occupations. "It is found," says the Ohio University Bulletin, "that most students taking mathematics work together in groups more satisfactorily than individually. Their interest and rate of learning is higher in a group, probably because of increased discussion, but also because of moral and intellectual support they gain from each other." Some veterans, as with some others of us, need to be cured of their fears regarding mathematics. One of the greatest helps instructors can give in teaching it is the building of confidence in the use of mathematics and the solving of mathematical problems.

In on-the-job and related instruction the problems of G.I.'s are the same as the problems of other adults. For them, as for all of us, the job is to bridge the gap from one kind of activity to another or to give the skills and knowledges required for productive labor. It is to prepare them to live socially and economically in a democratic society, and to enjoy leisure time spent wholesomely.

How can we rebuild ideals where they are destroyed, or confidence where it is lost? How can we teach the ways of democracy, or train in the skills and knowledges of occupations? By the application of the known and common methods of vocational teaching: Taking subject content from life situations, today, here, now, and breaking it down into the things one has to do to be democratic, to be social, to be occupationally competent, and the things one has to know in order to do democratic, social, and occupationally competent things. When these analyses have been done, they may be put into teaching form and taught, using the four steps — prepare students to learn, present the ideas, give opportunity for tryout experience, and follow up until the complete adjustment is made. By these methods can the problems of on-the-job training be met.

There is no other way.

G.I. Training Versus Civilian Education

J. W. GIACHINO
Associate Professor of Industrial Education and Supervisor of Aviation Training
Western Michigan College of Education
Kalamazoo, Mich.

A great deal of conjecture, speculation, and controversy is being waged regarding G.I. training techniques employed during the war period. On the one side, we have the armed forces who maintain that methods developed and used for war training purposes far surpassed anything currently used in the field of education. Opposing this viewpoint are the educators who insist that G.I. training was merely an adaptation of techniques long advocated and practiced by teachers in public schools. Perhaps this difference of opinion will stimulate some constructive research, thereby divulging what new means of training were evolved by the armed forces and, if any, how they may be utilized for the advancement of education in general. One such research project already is in progress — being conducted by the Commission on Implication of Armed Services Educational Programs under the auspices of the American Council on Education.

The purpose of this article is not to deny or justify the assertions of either faction but merely to present some personal observations as a result of experience while on active duty with one of the largest naval training activities. Regardless of the sources or nature of training allegations, it can be emphatically and unequivocally stated that G.I. instruction was effective. Although the objectives of any form of military training are usually diametrically opposed to the objectives guiding the education of youth, nevertheless both have certain elements in common. Whereas one seeks to train individuals to perform specific tasks of fighting, the other endeavors to prepare young people to live successfully in a democratic society. The implication here is merely this — each must employ certain training techniques to achieve their desired goal. The issue that is worthy of consideration at the moment is not the differences of function between G.I. and civilian training but the implied superiority, similarity, or differences of techniques used by the armed forces as opposed those employed by present-day educators.

Training Periods Reduced to Minimum

Due to the expediency of time and need it became mandatory during the emergency era to reduce training periods to an absolute minimum. Yet, in spite of the necessity for urgency, trained personnel were turned out regularly to meet the requirements of the activities in the fields of action. What then were the magical devices used by the armed forces to mold overnight, parenthetically speaking, raw recruits into efficient fighting men? The answer to this question possibly can be found by discussing the following topics: (1) training methods, (2) instructional material, (3) supervision, (4) instructor personnel, (5) equipment and building facilities.

Training Methods

Training techniques or methods are simply tools of teaching used to get across to students certain types of instructional material. There is no need, for this purpose, to identify or describe these various methods. At the moment, we are interested primarily in ascertaining: (1) Did the armed forces discover new training methods? and (2) Should teachers today adopt some of the G.I. training techniques?

To set the stage for answering these questions, a few enlightening facts should be mentioned. In general, it was the practice of the navy and the army to assign to various training activities, wherever and whenever practical, a nucleus of reservists with former civilian experience and training in educational methods. Some of these individuals were ex-school teachers and others, instructional supervisors or school administrators. Although it is not generally admitted, most prewar training in both branches of the service was pathetically antiquated. Moreover very few of the regular military personnel had any formal training or experience in running training programs. Consequently the brunt of the responsibility for establishing and conducting efficient and up-to-date instructional programs fell on the reservists. Inasmuch as these former ex-school people were trained in the techniques of civilian educational procedures, it was only natural for them to set into operation training patterns based on known educational practices.

Developing Techniques

To develop new techniques, whether in the technical or educational field, a certain amount of research is necessary. Although the armed forces did undertake the study of some problems relating to training, in general these studies did not, to any appreciable extent, focus directly on the development of new training methods. Their attention was centered more in devising new means of applying known educational training procedures. Considering the fact that *reservists* were required to concentrate their efforts in conducting training programs with very little provision for engaging in research work, it becomes apparent immediately that no new revolutionary teaching methods could possibly have materialized during the war period. It is not implied that G.I. training did not differ from most current civilian educational practices. The differences are simply in the manner teaching methods were used. In other words, the G.I.'s made more effective use of what educational research had heretofore uncovered. An excellent example of this is the extent to which visual aids were applied. Unquestionably, visual aids have been used by civilian teachers for a long time, but their real teaching values never were recognized and exploited as in G.I. training. Every teaching method employed in military schools, whether it was a lecture, demonstration, or discussion, was supplemented by innumerable types of visual aids. If any ex-serviceman is interrogated today, one thing he will unhesitantly stress is the manner in which his learning was simplified and accelerated through the many sight impression devices used by his instructors. Not only was his learning made easier but visual material provided greater motivation for learning and enabled him to understand and master better basic essentials. It is realized that visual material is expensive and the armed forces had ample funds as well as personnel to design, construct, or purchase the necessary visual aids. Nevertheless cost alone should not preclude the use of such aids if the net gain exceeds the gross expenditure. Although many types of aids are expensive, there is every reason to believe that with a little individual ingenuity backed by enthusiasm and a realistic conviction of their usefulness many less costly, and not infrequently, home-made aids could be made a part of any educational program.

Student Participation

Another illustration of the difference in the use of training methods is the extent G.I.'s were provided with opportunities to apply what they were learning. Here again the idea of pupil participation or learning by doing is something long recognized by educators. But it is doubtful if present-day teaching practices even begin to approach the maximum latitude and frequency with which military training employed this fundamental learning concept. Other examples could be cited to illustrate how G.I. training endeavored to put into more effective usage teaching methods but this would develop into a lengthy treatise. The limitation of the present discussion permits only a few generalities which may be best summarized by stating that:

1. No new teaching methods were discovered by the armed forces except that they utilized to a greater degree practices advocated by educators.

2. Present teaching methods can be vitalized and made more functional if some of the *teaching tricks* developed by the G.I.'s would be incorporated in most instructional programs.

Instructional Material

A factor that was instrumental in producing succecssful G.I. training programs was the excellent planning of all instructional material. Every type of training was controlled by detailed courses of study which outlined specifically the material that had to be taught. These courses of study were based on very definite objectives. Teaching content selected for a particular course was carefully analyzed and frequently evaluated to insure good continuity of training and up-to-date instruction. The criterion for incorporating instructional material in a course of study was not based on what some individual arbitrarily thought trainees should know but on what the field required for the job to be done. If material could not be justified as having contributing values in implementing the objectives of the course it was not included. In other words, a lesson had to be purposeful whether it was prescribed to develop proper attitudes, military discipline, or performance of precision manipulative operations.

Excluding the Irrelevant

It is a common fact that courses taught in most educational institutions are based on certain requirements and objectives. However it is doubtful if the content of many such courses are ever analyzed with such thoroughness as were those in G.I. training. Quite frequently it is a practice for civilian school people to include a unit of instructional material simply because it is part of a text written by someone who has attached some importance to it. Too often insufficient thought is given as to how a course or a phase of instruction in a course *ties-in* with the over-all pattern of an individual's education. Perhaps it is necessary during the process of training young people to teach material that has deferred values. Unfortunately, teaching deferred values is often influenced by hearsay, and does not rest on absolute concrete facts. If many of the present-day courses of study were periodically appraised and every item of instructional material judiciously weighed to the same degree as it was in G.I. instruction, much irrelavent teaching material could be eliminated.

The armed forces realized from the very beginning that the intelligence of the masses is not much higher than that of a 12-year-old mind. Accordingly, they reasoned that if instruction was to be understood, printed material had better be as simple as possible. Unlike so many of the present-day "dry-as-a-bone" textbooks the armed forces used a language that was simple and easily understood by all. They removed verbalism, mystery, and profundity which is often characteristic of many public school textbooks. By reducing all the ramifications of teaching matter to the simplest elements, it was possible to accelerate learning and make it more effective.

Supervision

Supervision is a function which is intended to provide and promote teacher and pupil guidance, growth, achievement, instructional efficiency, and harmonious relationships. Good supervision is an indispensable function of any training program. Too often it exists in name only and does not, in the true sense of the word, accomplish its designed purpose. Supervision frequently degenerates into one or two forms — "snoopervision" or administration. When this happens, supervision becomes more of a liability than an asset.

Contrary to the usual type of supervision found in some civilian educational systems, the general run of military schools operated under the most constructive form of supervision. Technical experts who understood supervisory procedures were entrusted with the task of conducting efficient training programs. Even though the schools were operated on a military basis, instructional supervision was not governed by military measures. Instructors accepted supervision as a necessary instrument of training. They were sold supervision rather than forced to accept it. As a result, instructors worked with supervisors in bettering a program instead of serving under and for them because line of authority so dictated. Perhaps the more important factor was that supervisors actually did supervise. These individuals were not unnecessarily burdened during the school day with numerous other collateral duties which interfered with their task of supervising. They devoted their time to helping instructors use the most effective teaching techniques, providing means for instructors to keep instruction constantly up to date, assisting in devising essential instructional aids, evaluating instruction and insuring that the highest form of morale prevailed among instructors and trainees. They worked with instructors in preparing courses of study and instructional material and made necessary adjustment whenever discrepancies would tend to jeopardize the functioning of any aspect of the training. In short, G.I. training not only had the right kind of supervision but it provided the right personnel to effect this important mission.

Educators have always recognized the need for adequate supervision. Yet frequently it is found lacking in public schools either because of insufficient funds to provide the right kind of supervisory personnel or administrators have misguided conceptions as to the purpose of supervision. It is not too uncommon to find a supervisor's position relegated to perfunctory tasks and assigned to individuals as a form of reward. In military schools, supervisors were considered key people and they performed an important job in a most commendable manner.

Instructor Personnel

It is axiomatic that a training program may be expertly planned and possess the finest equipment and the most elaborate building facilities and yet be far below accepted standards. School authorities often become so involved in administrative details that they lose sight of the importance of the teacher. In reality the success or failure of any instructional program rests entirely with the teacher. If teachers are of mediocre caliber, then training inevitably will be just mediocre; conversely if instructors are expertly trained, the program will be reflected accordingly.

To keep G.I. schools on the highest possible level, four safeguards were established:

1. The instructor personnel selected were fully qualified in their field.
2. An adequate instructor training program was established to prepare the technical experts to teach.
3. An in-service training program was arranged to keep instructors continually up to date professionally and technically.
4. A low trainee-instructor ratio was maintained.

The retort may be made that the foregoing factors are not new — that educators have advocated these for years. The one important difference is simply this — the armed forces were not content to merely advocate, but they employed every possible means to insure that these safeguards were actually and consistently put into practice. Potential instructors were carefully screened so only the most qualified would be selected. Further sifting took place as the instructor candidates were put through a teacher training course. Once on the job, these instructors were kept qualified through upgrading programs. For example, if a new piece of equipment was due to be manufactured, certain key instructors would be sent to the factories to get first-hand information. Upon their return they would conduct a series of classes to teach the other instructors the information and operation of the new gear. Then again if an instructor was experiencing some difficulty in the demonstration technique or his method of delivery needed some refinement, the in-service courses provided additional training to remedy these weaknesses.

Class Size

Classes were kept small. Usually not more than 15 students were assigned per instructor. For some of the more complicated phases of instruction, it was nothing unusual to have a trainee-instructor ratio of 8 to 1 or 5 to 1. The armed forces knew that success in teaching meant recognition of individual student capacity. By keeping the ratio of trainees and instructors low, more could be done for individual students with greater effectiveness and in shorter periods. It is difficult to envision the limitation of numbers in public school classes to this size. Most schools will average closer to 30 students per instructor.

Perhaps many G.I. instructors did not quite measure up to the commonly ascribed definition of teacher — possibly they did not know too much about the history of education or all of the profound manifestations of psychological principles, yet they did know three things: (1) they knew their subject, (2) they knew how to get their material across to their students, and (3) they knew how to handle people.

Equipment and Building Facilities

It is needless to state that without adequate equipment and suitable building space, instruction is hampered right from the start. Regardless of the nature of training, there must be the right kind of equipment and in sufficient quantities to enable all students to get as much practical experience as possible. Not only must there be enough equipment to serve all students, but it must be of current quality if it is to provide up-to-date instruction. Furthermore, ample space must be available to properly house the equipment and provide enough freedom of movement so students can work to their maximum efficiency.

Undoubtedly one of the major difficulties of most public schools is to provide the necessary type and quantity of equipment as well as the required building facilities. Authorities, despite their sincere desires to establish the right kind of instructional programs, are often seriously handicapped because of insufficient funds.

The programs conducted by the armed forces during the war period were furnished with the money necessary to secure whatever equipment and building space that was needed. This proved to be another major factor in the successful training of service personnel. There was on hand all the implements required for training. Students did not have to be crowded into small spaces, nor was it necessary to double up because only a few pieces of equipment were on hand.

Thus by providing ideal learning situations, students were exposed to an atmosphere that was conducive to good learning.

Summary

What made G.I. training so successful? Here in brief is what the writer believes were the principal contributing factors:

1. The armed forces made tremendous progress in simplifying teaching methods although they themselves did not originate any heretofore unknown teaching techniques. Greater attention was centered on individuals and every possible trick was used to develop the right kind of motivation for learning. Innumerable devices of every description were brought into play to assist all students to master instruction.
2. Ample funds were made available for every conceivable essential for conducting effective instruction.
3. Well-trained instructors were provided who were experts in their specialty and knew how to teach.
4. Classes were kept small.
5. A functional type of instructional program was organized that enabled trainees to use to the maximum limit all the important and commonly used mediums of learning.
6. Simplification of textbook material.
7. The right kind of supervision.

Foremanship Training and The Conference Method

H. W. PAINE
Professor
Vocational Education
Teachers College
University of Cincinnati
Cincinnati, Ohio

(Continued from page 47 of the February, 1947, issue)

Summary and Conclusions

In the preceding articles of this series we have reviewed the various types of conference services carried on by state boards for vocational education and their co-operating agencies, and have outlined the techniques involved in conference leading, particularly as practiced with foremen groups. In addition we have pointed out that the same principles and techniques apply when this method is used for high school shops and classes.

In school use, the teacher may have a little difficulty at first in keeping in mind the fact that he is really *leading* a conference, not *teaching* a class. He should put the teaching that needs to be done in the introductory statement of his conference and attempt to keep the "Body of the Conference" a *true* conference because, and it should be stated again and again, the conference is a pooling procedure; it *teaches by pooling the knowledge of a group and making it available to all.* Its effectiveness depends upon the background of the group concerning the particular topic under consideration and the skill of the leader in guiding the collective thinking of the group. Therefore one should use discrimination in selecting the conference method as an approach to a problem and should be sure that it is the appropriate tool to use for the group and for the subject at hand.

In the several phases of foreman training, effective conference leading becomes of greater and greater importance as industrial relations become more complicated and involved. Its analytical approach to solving supervisory problems has done, and is doing, much to hold human relations in American industry on an even keel. Given the opportunity to work with open minds, it can do much to solve troublesome problems of many kinds both in industry and in school.

If one cared to make predictions as to future developments in the foreman conference areas of work, forecasting the future by trends in the past, he would probably predict that heavier and heavier calls for service in conference leadership training would be received by the various vocational teacher training agencies of the state boards and universities, and that local vocational education agencies would be called upon to offer more and more foreman improvement courses on an evening school trade extension basis. Industry will make greater and greater use of the conference method in its supervisory meetings.

Vocational teacher training agencies, foreman conference leaders, and industry will undoubtedly experiment with various types of foreman conference meetings and procedures, applying the knowledge gained from the thousands of short term programs carried on under the training within industry movement during the war — under the captions of job instructor training, job relations, training, and job methods training. This is as it should be; foreman training must be kept dynamic, not static, and these T.W.I. "war children" of the original foreman conference leadership training, instructor foreman training, and foreman improvement courses should have certainly been able to contribute much to the development of new approaches and new techniques.

In conclusion it should be pointed out that the greatest assets of the conference method are its informality, its simplicity, and the fact that its results represent the decisions of the *group, not* the *leader*. It has proved its value in American industry; it is proving its value in many situations in America's schools. This article concludes with the suggestion that progressive shop and classroom teachers try it. School people will be as pleased, and perhaps amazed, by its effectiveness in solving school problems as industrial leaders have been gratified by its benefits in industry.

Sample reports of complete conferences follow to demonstrate the effectiveness of the procedure and to disclose the type of materials developed in typical conferences under varying situations.

Sample Industrial Conference

Topic: Proper Use of Authority
Leader:
Objectives:

1. To define authority.
2. To list factors or practices involved in the proper use of authority.
3. To suggest possible results when authority is improperly used.
4. To recommend remedies for situations arising from improper use of authority.

Introduction:

It has been said that "No man will ever be a great executive who feels that he must, either openly or under cover, follow up every order that he gives; nor will he ever develop a capable assistant." We have probably all had experiences or close contact with those in authority when it seemed that the power of their position was used improperly, and we have noted such things as sullenness, non-co-operation, hard feelings, ill will between foremen, increased disciplinary problems and other difficulties arise

among employees because someone overstepped his bounds of authority. Probably the first point that should be made is to agree on a definition of authority so that we will all start with similar points of view in discussing the topic.

Body of the Conference

Question 1: "How Shall We Define Authority?"

Definitions: (Suggested by members of the group.)

1. Authority is the use and control of direction and supervision toward others.
*2. Ability to issue an order that is expected to be carried out.
*3. Responsibility of issuing orders and seeing that they are carried out.
4. Authority is control, over persons and objects, which is given to individuals in order that certain accomplishments may be obtained.

Question 2: "What Are Some of the Wrong Practices You Have Noticed, What Was the Result, and How Could the Bad Effects or Results Have Been Avoided?"

Let's develop a list which shows the improper use of authority, based on the three parts of Question 2.

Wrong or Bad Practices

1. Insisting on the use of inferior methods
2. Issuing useless orders (giving orders to workmen who will eventually do what is expected of them)
3. Issuing orders at the wrong time
4. Issuing orders that are not understood
5. Giving too many orders at one time
6. Reprimanding too critically
7. Complaining to superiors about subordinate without knowledge of subordinate
8. Arguing
9. "Bossing" men in other departments
10. Continually finding fault instead of issuing orders
11. Threatening to discharge
12. Familiarity
13. Acting too reserved
14. Gossiping
15. Overbearing attitude

Results to be Expected

1. Ill feeling: less production
2. Irritates employees; loss of respect
3. Dissatisfied workers
4. Mistakes; increased costs; lowered production
5. Confusion
6. Resentfulness and bad feelings; may increase accidents
7. Ill feelings; loss of respect; lowered morale
8. No settlement of problem
9. Dissension and hard feelings
10. Discouragement; antagonism
11. Dissatisfaction; feeling of insecurity; loss of respect
12. Loss of authority; lowered production
13. Lack of co-operation
14. Bad feeling; loss of respect
15. Resentment

How to Avoid or Improve

1. Analyze jobs for most efficient methods of doing them
2. Think ahead
3. Better planning; clearer thinking
4. Give orders clearly and distinctly; have orders repeated if in doubt as to whether they are understood
5. Anticipate changes in advance

*An interesting discussion took place over the statements as they appear. It was generally agreed that authority involved something more than the ability to issue an order as one might possess the ability to issue an order but lack the authority to enforce it. The point was also made that persons who issue orders must assume responsibility but that the assumption of responsibility does not necessarily mean that the person has the authority to issue orders. Quite universal agreement was reached on the point that a person in authority has the power to issue orders and see that they are carried out because of the general opinion among others and the esteem in which he is held by them. The fourth definition, therefore, appeared to bring out more definitely the meaning of authority as interpreted and defined by members of the group.

Typical conference group in action. Wagner Mfg. Co., Sidney, Ohio. Cable Wagner, conference leader

6. Call man to one side; reprimand privately
7. Advise subordinate of possibility or necessity of reporting "higher up"
8. Frank discussion; abide by decision of respected third party
9. Advance agreement on areas of supervision; inform co-worker of action, on the side
10. "Think of the other fellow"
11. Keep promises; make no promises that can't be kept
12. "Friendliness without fraternization"
13. Make an effort to be more friendly
14. Stop rumors; get the facts
15. Practice the Golden Rule

Summary:

The proper use of authority sometimes involves many factors concerning men, materials, and methods. The well-known fact that "people are different, and proud of it" may be of vital importance in the success or failure of an administrator in exercising his power of authority. Many shops or departments appear at first glance to be "running themselves," yet one cannot remain long without realizing that definite authority exists which is based largely on the high esteem and respect that the entire personnel has toward those in authority. In other cases great confusion exists. Men work feverishly and under apparent fear and apprehension that in spite of their best efforts their work will not be satisfactory.

Few are the difficulties, resulting from the improper use of authority, that cannot be avoided by close co-operation and understanding between those in authority. Consideration for those who receive the orders is also important. Appointment of employees to positions of higher responsibility presupposes that the foreman or supervisor in his willingness to assume added responsibilities will be the directive head of his shop or department and that orders affecting his work or personnel should be given to him for execution. However, with an understanding and full appreciation of the other fellow's problems it is possible to exercise authority in the most pleasant and agreeable manner and to work in harmony and unity toward the common goal in any industry — the success of the company.

Report of Sample Conference of Vocational Teachers

Topic: Better Discipline in the School
Leader: E. G. H.
Objectives:
Direct:

1. Find ways of controlling group
2. Find ways of directing groups

Indirect:

1. To help and teach all of us to handle our classes better

Introductory Points:

1. When discipline is lacking educational content is poor.
2. When discipline is lacking, results are nerve racking.
3. When discipline is lacking, it destroys morale.
4. When discipline is lacking, a poor example is set for others.
5. Administrators want good discipline.

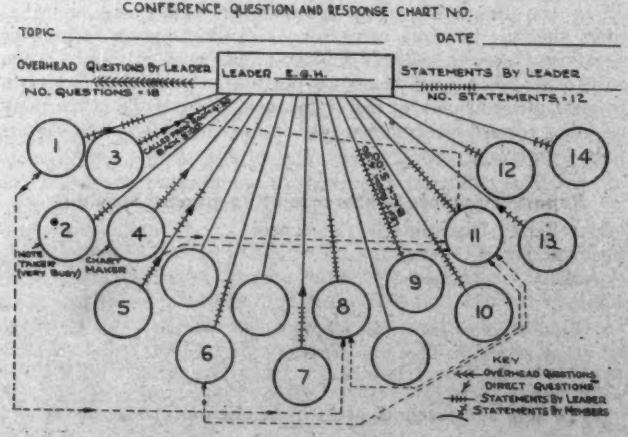
Body of Conference

Evidence of Poor Discipline or Training

1. Excessive talking
2. Lack of attention
3. Learners wasting time
4. Lack of self-control
5. Slow starting to work
6. Defacing school property
7. Primping in class
8. Carrying home habits into school
9. Lack of interest in subject
10. Whistling, humming, and singing
11. Throwing objects
12. Visiting
13. Poor housekeeping
14. Personal cleanliness
15. Reading comic papers
16. Chewing gum
17. Passing notes
18. Spit on floor
19. Unprepared (supplies, homework)
20. Care of tools and equipment
21. Theft
22. Inefficiency
23. Dishonesty
24. Lack of safety
25. Fear of instructor, machinery, job
26. Disobedience
27. Insolence
28. Punctuality
29. Absenteeism

Causes of Poor Discipline

1. Teacher slow to start. 1-2-3-5-7-9-10-11-12-13-15-17-19-22-28-29
2. Physical setup of rooms. 2-6-13-14-11-17-15-18-3-1-23-8
3. Teacher's personality and enthusiasm
4. Teacher's enunciation
5. Teachers unprepared
6. Teachers in a fog
7. Students sent to school for convenience' sake
8. Disruption of routine
9. Lack of teachers
10. Presence of court cases and subnormals in class
11. Lack of aptitude of student



12. Physical conditions
13. Weather

Remedies of Poor Discipline

1. (*a*) Teachers and pupils in place on time
   (*b*) Presentation
   (*c*) Prompt starting
   (*d*) Careful assignments
2. (*a*) Rearrange seating
   (*b*) Good lights
   (*c*) Ventilation
3. (*a*) Avoid favoritism
   (*b*) Check teacher's health
4. Special training
5. Effort and caution
6. Improve health and enthusiasm
7. Lesson planning
8. Job sheets

Conclusions

1. Direct (*a*) demands
2. Indirect (*a*) telling learners
3. If indirect method to be handled properly, it will solve the problem

Criticisms, Comments, and Suggestions for Improvements

Good Points

1. Very good conference
2. Shows unusual interest
3. Very high enthusiasm
4. High grade conference
5. Well conducted
6. Moved rapidly
7. Good use of blackboard
8. Good appearance
9. Good topic
10. Cleared each item off the board before going on to the next
11. Good poise and very good English used
12. Had conference very well planned
13. Shows group that their own contributions govern success of conference
14. Obtained good distribution of responses
15. Had group interest from beginning
16. Good and well presented
17. Very businesslike
18. Good voice and appearance
19. Good personality
20. Good points in summary
21. Excellent introductory statement
22. Putting the load on the group was good practice
23. The device of checking each cause vs. all items proved to be very good
24. An excellent conference
25. Summary well done considering time available

Poor Points and Suggestions

1. Topic should have been written on the board
2. "Discipline" should have been defined at start
3. Too long getting to causes, remedies, conclusions
4. Stated his own ideas too frequently
5. Did not remain neutral
6. Did not allow time for group to participate in conclusions
7. Topic too broad for time assigned
8. Makes chalk squeak too much at first
9. Let himself be put on spot by promise to complete the conference in so short a time
10. Rather a broad subject for a short time
11. More time needed on causes and remedies
12. Not enough time for summary

Report of Sample Conference of Vocational Teachers

Topic: An analysis of the responsibilities of a trade co-ordinator
Leader: C. G. S.

Objectives:

Direct:

1. To determine and to list these responsibilities
2. To evaluate these responsibilities
3. To determine methods of improving co-ordination

Indirect:

1. To have faculty understand the work of the co-ordinator
2. To suggest improvements in methods of co-ordination as they affect the faculty

Introductory Statement:

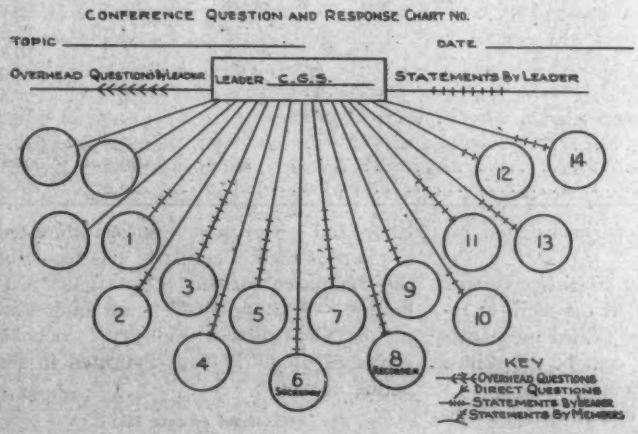
1. Historical development of the job of a co-ordinator
2. Job of a co-ordinator is more interesting than that of a director because of varied contacts; school, industry, home, labor union
3. Co-ordinator is nearer person being trained than either director or teacher
4. A co-ordinator can become an important factor in the success of a vocational school

Body of the Conference:

I. *Definition:* Co-ordination is the tying up of the work experiences on the job with the educational work in the school.

The Responsibilities of a Co-ordinator Arranged in the Order of Their Importance

1. To co-ordinate the work of the outside training agency with that of the school (major responsibility)
2. To find the proper learning experience for the perspective apprentice
3. To see that the student apprentice gets the proper sequence of job experience
4. To prevent exploitation of student apprentice
5. To check the progress of student apprentice in school and on the job, office records and reports
6. To find the apprentice best fitted for a particular job in industry
7. To interpret the trade to the related and other subjects teacher
8. To interpret the trade to the student apprentice
9. To inform industry about the ability and willingness of school to participate in a training program
10. To readjust physical and psychological and sometimes reactional misfits
11. To evaluate the program and the needs by surveys and by follow-up
12. To inform the school about technological changes in trade and business
13. To intrepret the purpose and the objectives of the school to the parents. Training for skilled trade and not merely getting a job.
14. Interpret the objectives of the school to organized labor



15. To oversee curriculum construction and to interpret the same

Methods of Improving Co-ordination

1. More frequent meetings of co-ordinators and instructors
2. More frequent meetings of co-ordinator and those in charge of training program in industry
3. Instructors should see work being done in industry
4. Closer relations of co-ordinator with journeymen as well and those in charge of outside training program
5. Free co-ordinators of excess teaching to allow more time for both outside and inside contacts

Conclusion and Summary

Good co-ordination is an important factor in the success of a vocational education program.

Co-ordination includes not only placement but limited guidance and counseling. Limited guidance which resolves into testing and tryout and readjustment.

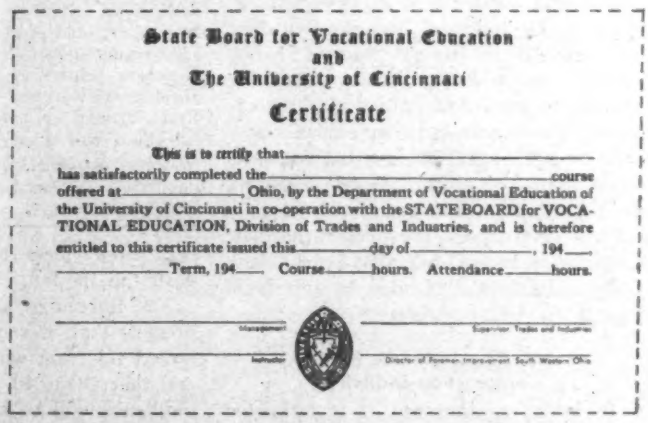
Comments on the Conference

Favorable

1. Data well organized
2. Systematic tabulation of data
3. Many directed questions
4. The interest of the group in general was apparent
5. Good distribution of responses
6. Introductory statement well done
7. Device of leaving group fill out blanks rather interesting; perhaps a good thing as it emphasized certain points
8. Co-ordination was defined at the beginning of the conference and general agreement secured upon it.
9. Some very excellent material was developed
10. Materials were developed systematically, some points being held back until they fitted in
11. Indirect objectives were well chosen. Very good
12. Good use of blackboard
13. Good subject
14. Some good points brought out that we would not think of applying to co-ordination
15. Exhibited qualities of a leader
16. Guided the discussion expertly
17. Good background and experience for type of conference
18. Good responses
19. Keeps in mind questions or statements made that are premature and called for them later
20. Data well organized; good evaluation
21. Took time to clear up points
22. Conference indicated that leader knew his subject

Unfavorable Comments

1. Lack of time
2. Lecture instead of conference



State Board for Vocational Education
and
The University of Cincinnati

Certificate

This is to certify that _____
has satisfactorily completed the _____ course offered at _____, Ohio, by the Department of Vocational Education of the University of Cincinnati in co-operation with the STATE BOARD for VOCATIONAL EDUCATION, Division of Trades and Industries, and is therefore entitled to this certificate issued this _____ day of _____, 194__.

_____ Term, 194__ Course _____ hours. Attendance _____ hours.

_____ Management _____ Supervisor Trades and Industries

_____ Instructor _____ Director of Foreman Improvement South Western Ohio

Sample completion certificate

3. Not enough direct questions at first
4. Discussion developed slowly
5. Room too warm
6. Some words hard to read on the board
7. Conference a little too slow at times
8. More enthusiasm might have helped
9. Did too much talking and made too many decisions

Certificate of Completion of Conference Work

Certificates are usually issued to all members of a conference leadership class who have successfully completed the work of the course and have maintained a satisfactory attendance record. Usually an attendance of 75 per cent or better is required.

These certificates are customarily issued jointly by the State Board for Vocational Education and the Department of Vocational Education of the University carrying on the actual teaching of the conference leadership course. These credentials are usually signed by the State Supervisor of Trades and Industries, the director of the work in the Department of Vocational Education of the University, and the instructor in charge of the class. Some certificates provide an additional line for the signature of some representative of top management.

These certificates seem to be prized very highly by the foremen and probably do much to encourage regular attendance. A sample certificate used in one Ohio institution is shown here to illustrate their general form and content.

The Impending Shortage of Construction Workers

S. LEWIS LAND
Director, Vocational Teacher Education
The Pennsylvania State College
State College, Pa.

Reliable governmental and private agencies estimate a probable construction volume during the next ten years of approximately 1,000,000 new family units per year or 10,000,000 family units during the ten-year period. Estimates of ten different recognized agencies range from 900,000 to 1,600,000 homes per year.

Probable Future Volume of Construction

The National Housing Agency established last year for its goal for the two-year period, 1946–47, a total of 2,700,000 homes, 1,200,000 in 1946 and 1,500,000 in 1947. Due to labor and material shortages, rising costs of construction, and other factors, actual construction in 1946 fell far short of this estimate. According to data just released by the Bureau of Labor Statistics, only 670,000 housing units were started in 1946 and only 455,000 completed. The Bureau of Labor Statistics predicts for 1947, 1,000,000 new dwelling units to be started of which 950,000, according to its estimate, will be completed.

In dollar volume it is estimated that new construction in 1947 will total $15,500,000,000, the largest dollar value for any single year in the country's history.

Labor Requirements for the Construction Industry

In labor requirements, it is estimated that more than two and one half million workers will be needed on the site of new construction at the year's peak next September. This is larger by three quarters of a million workers than last year's labor requirement and approaches the previous peak employment in the construction industry in the late 20's.

The Bureau of Labor Statistics further predicts that over half of the workers required this year will be skilled mechanics and that about 40 per cent of the skilled mechanics will be carpenters.

These estimates are confirmed by a similar estimate of 2,513,000 men needed for construction in 1947 made by the Committee on Opportunities for Veterans in the Construction Industry. This industry-wide committee represents 22 different employer, labor, and government agencies interested in the construction industry. The report of the committee entitled "Opportunity Unlimited — A Guide for Veterans Interested in the Construction Industry," includes estimates up to 1949 as indicated in the listing above:

Number of Men Needed on Construction Jobs

Occupation	*Estimated Employment in Thousands of Workers* 1947	1948	1949
Total	2,513	2,773	2,837
Superintendents	30.5	34.0	35.0
Foremen	183.5	201.5	206.0
Clerks	22.0	24.0	25.0
Skilled workers	1,090.0	1,203.5	1,229.0
Bricklayers, masons	95.0	107.0	110.0
Carpenters	501.5	550.0	562.0
Electricians	47.0	52.0	53.0
Equipment operators	68.0	75.5	77.5
Lathers	15.5	17.0	18.0
Painters	103.5	113.5	116.0
Plasterers	51.5	57.5	59.0
Plumbers	63.5	71.0	72.0
Sheet-metal workers	17.5	19.5	20.0
Steam fitters	12.5	14.0	14.5
Structural reinforcing and ornamental-iron workers	36.0	40.0	41.0
All other skilled workers	78.5	86.5	86.0
Semiskilled workers	273.0	303.0	312.5
Bricklayers' and plasterers' helpers	43.5	49.0	50.5
Electricians' helpers	13.5	15.0	15.0
Plumbers' helpers	26.5	30.0	30.5
Sheet-metal workers' helpers	4.5	5.0	5.0
Truck drivers	118.0	130.0	135.5
All other semiskilled workers	67.0	74.0	76.0
Unskilled workers	914.0	1,007.0	1,029.5
Laborers	883.5	973.5	995.5
Watchmen, misc.	30.5	33.5	34.0

(Continued on page 158)

Industrial Arts and Vocational Education

John J. Metz, Editor

THE STUDENT AND HIS FEARS

Apprehension is a formidable barrier to the acquisition of knowledge and skill. There are some students, fortunately not many, whose imagination can portray fancied dangers or difficulties so vividly, that they need much sympathetic and thoughtful help from the instructors of those subjects in which the student may have his particular psychosis.

This applies especially to shop subjects, because there are students who possess a real fear of being hurt when working with edged tools and power tools.

The very fact that the instructor must stress safety practices may increase the mental fear possessed by some of the students who are just starting in his class. It takes planning then to prepare a safety lesson that will allay the fears without minimizing the thought that there is great need for caution.

Students who have these deeply impressed apprehensions should not be ridiculed because of their fears. That would only prompt the student to add the fear of ridicule to the apprehension which he already has.

Probably it may be just as well to plan all safety lessons as though they were intended for students of this type. In this way the boy possessing the psychosis will be definitely helped, while the normal student will look upon the material simply as a safety lesson.

The same treatment, as far as presenting subject matter to beginners, may also be applied in courses other than shop and safety. There seems to be no point in telling a new class how difficult a new subject is, or how many students are flunked in it every year. It is far better to inform the student of the necessity of laying a good groundwork in the new subject, and then help him to understand the new material by simplifying it as much as possible for him.

In most courses it would be a definite help to the student if the instructor gave some indication of where the emphasis should be placed in successive lessons. In this way the student can acquire a better organized grasp of the subject and will be able to pass his examination with a fairly good mark.

ANOTHER HUNDREDTH BIRTHDAY ANNIVERSARY

On March third was celebrated the hundredth birthday anniversary of Alexander Graham Bell. He was born in Edinburgh, Scotland, on March 3, 1847, and received his education at the Universities of Edinburgh and London.

Because of poor health, he came to Canada with his father in 1870. In 1872 he received an appointment to train teachers of the deaf in Boston.

While he maintained his interest in the deaf throughout his life, the achievement that brought him fame was the invention of the telephone, which by March 10, 1876, had been developed to the point that it transmitted the historic sentence "Mr. Watson, come here; I want you," which ushered the new invention into life. In May, 1876, he demonstrated the telephone to the American Academy of Arts and Sciences in Boston, and again, in the same year, at the Philadelphia Centennial Exposition. The Bell Telephone Company was organized in July, 1877.

The Volta Prize, 50,000 francs, was awarded him for his invention. With this money he founded the Volta Laboratory where he, with others, could work on the solution of other problems.

He also invented the photophone which made possible the transmission of speech by means of light rays, and he originated a number of improvements on the phonograph. He became quite interested in the study of aviation, and the Aerial Experiment Association, which he helped to found in 1907, assisted such men as Curtis, Baldwin, and others to make the phenomenal strides which brought about present-day aeronautical developments. His liberality established the astrophysical observatory at the Smithsonian Institution.

He was known as a great lecturer and did much writing, especially on his favorite theme of deafness, its nature and causes, and how those, who have been afflicted with it, can be helped to overcome their handicap.

In 1883 he founded *Science*, a magazine which was made the official organ of the American Association for the advancement of science. In 1898, Congress appointed him regent of the Smithsonian Institute. He was an active member of many societies devoted to science and learning. He died at his summer home near Baddeck, Nova Scotia, on August 2, 1922.

Alexander Graham Bell is another worthy exemplar for boys in the industrial arts and vocational education shops to study. His altruism, his earnestness in trying to arrive at a workable solution, and his perseverance in overcoming obstacles can well serve as a model for them.

DESTRUCTIVE FIRES

The winter is approaching its end, yet it may be well to check over once more whether the school heating system is not a fire hazard. While doing this, the shop teacher and the janitor may do well to make the inspection an object lesson for the shop boys. Have them help in making the inspection and show them what to look for in their own houses. Other probable fire hazards should not be overlooked in making the inspection.

According to the National Board of Underwriters, the national fire waste in 1946 increased at the highest rate in history.

Fires during the first ten months of that year presented a loss of $458,687,000. This was 24.5 per cent higher than the same period in 1945. As a matter of fact, the fire loss during those ten months was greater than in any previous full year from 1930 to 1945.

If the same rate of increase applies in 1947, the first ten months will present a fire loss of $566,441,395.

The number of fires also is on the increase. New York City, for instance, had 31,316 fires during the first nine months in 1946 as compared to 23,759 during the same months in 1945. This is an increase of 32 per cent.

What is still more deplorable is the fact that deaths due to conflagrations are also increasing. Crimes of carelessness exact a heavy penalty and if the school makes an effort to interest students in making prevention a live issue, fire wastes may, and most likely will, be reduced.

THE TAXPAYERS SHOULD RECOGNIZE

More than 350,000 teachers, over and above natural losses, have left the profession in the past few years. Many of these teachers, because of low salaries, have left to enter more remunerative occupations. If this continues, the teaching profession will attract only the mediocre.

Public respect demands highly trained professional teachers. The public also ought to remember that these teachers should receive professional salaries, salaries that will attract teachers to whom we can entrust our youth.

(Continued from page 156)

National Apprenticeship Plans

It is encouraging to note that several national trade associations and several international labor organizations in the construction industry have taken steps to recruit and train adequate numbers of apprentices to meet the large demand which is anticipated in the future. With the cooperation of the Apprentice Training Service of the U. S. Department of Labor, employer associations and labor unions have developed national programs and plans for the employment and training of apprentices. Such programs have been developed for electrical workers, plumbers, steam fitters, bricklayers, plasterers, and others.

Establishment of Working Relationship With Industry and Labor

Local directors of vocational education have established and maintained working relationships with local labor organizations and local employer associations affiliated with their respective international unions and national trade associations. Through these contacts made on the local level, information can be secured concerning these national programs of apprenticeship.

Apprenticeship programs in most of the groups in the construction industry range in length from two to five years. Consequently, apprentices recruited in 1947 are not available for employment as journeyman mechanics until sometime in 1949 to 1952. It is important, therefore, that adequate provision should be made now to meet the demand for skilled mechanics in the years ahead. Let us not let the experience following World War I in the late 20's be repeated following World War II in the late 40's and early 50's. The shortage of skilled mechanics in the construction industry during the period 1925 to 1930 was a matter of concern to employers, to organized labor, to governmental agencies, as well as to schools. We failed then to make adequate provision for the training of skilled mechanics in adequate numbers to meet the need. We should benefit from the experience of that period and make sure that adequate numbers are trained to meet the needs in the program of building construction which lies in the immediate years ahead.

Employer associations and labor unions on the local level are interested and willing to co-operate with local vocational officials in the establishment of adequate training programs to meet the local needs for construction workers. No attempt is made here to suggest a formula for the determination of numbers to be trained, which will apply to every local situation. Needs in each local community will vary depending upon a number of factors such as the volume of building in the local community, the number of construction workers already employed, the ages of construction workers already employed, training programs already underway, and the like.

Determining Numbers to Be Trained

Some of the factors, therefore, which the local director should consider in determining the number of workers to be trained, are the following:

1. *Increased demand due to increased growth in population* or other factors calling for increased rate of construction. Information as to the probable trend and as to the anticipated future volume of construction can be secured from local chambers of commerce, local employer associations, and from organized labor.

2. *Number and age of workers already employed.* It is not enough to merely determine the number of workers already employed in a community when determining numbers to be recruited and trained to meet the future labor supply. It is important to determine the age of the workers already employed. In one large community where the adequacy of labor supply for a particular industry was studied, it was determined that practically no workers were employed in the age bracket below 45 years. This factor is of increasing importance as the social security program effecting retirement of workers becomes effective. There will be an increasing tendency in the future for workers to retire at 65. In another city where the labor supply for a particular field was studied, it was determined that a large percentage of workers in the age bracket above 60 years were in active employment, pointing to the necessity of immediately inaugurating a training program since in this field a five-year apprenticeship period is in effect.

3. *Occupational change, death, and retirement.* These also are factors to be studied in determining the numbers to be recruited for training in any particular field. Certain information on trends as regards occupational life expectancy is available from the Policy Holders Service Bureau of the Metropolitan Life Insurance Company. As an illustration in a study of the life insurance records of a group of skilled tradesmen, it was determined that of 46 plumbers and steam fitters, 29 or 60 per cent remained in the same occupation throughout their lives, two transferred to other skilled trades, four became laborers, five manufacturing operatives, two railway employees, and one became a clerical worker.

Factors regarding numbers to be recruited due to death and retirement are closely associated with what has already been said in connection with the determination of ages of those already employed.

4. *Loss of apprentices while in training.* Each local vocational school official can determine for his own program, on the basis of past experience, the additional numbers which should be started in a training program to compensate for those who discontinue the program while in training. In a study made covering 607 apprentices in 20 cities who had been registered over a period of five years, 338 or 55.6 per cent were still connected with the industry as apprentices, 132 or 21.7 per cent had advanced to the rank of journeyman, three had become contractors, leaving only 22.6 per cent who had changed to other occupations or had gone into other employment. This information which has significance in the development of plans for the training of adequate numbers of skilled mechanics can be secured by each local director for his own local vocational program.

Providing Adequate Training Programs

It is important, therefore, for each local community to provide machinery for the inauguration of adequate training programs for all branches of the construction industry to meet its local employment needs. Many communities already have inaugurated co-operative plans with employer associations and labor unions through the establishment of joint advisory committees to co-operate with the schools in the organization and maintenance of comprehensive training programs to assure adequate numbers of skilled craftsmen for all branches of the construction industry.

Adequate programs for the training of mechanics for all branches of the construction industry incorporate: (1) part-time and evening classes for apprentices already employed, (2) full-time day trade programs — two, three, or four years in length, and (3) evening trade extension classes for journeyman mechanics.

It has been said recently that housing is our number one problem in America today. Let us take steps now to assure to employers and labor the co-operation they need from the schools in providing an adequate labor supply to meet all the employment opportunities in the construction industry.

The disabled man is not a handicapped worker when he is properly placed. He is steadier, more careful, and less inclined to absenteeism; and he generally turns out equal or superior work. — *L. B. Schwellenbach,* Secretary of Labor.

Providing Building and Teaching Facilities for Art Education

LEON L. WINSLOW
Director of Art Education
Baltimore, Md.

The art curriculum class in commercial art offered in the Baltimore public schools aims to provide an insight into advertising and display, the art employed in business

The Present Situation

The prevailing situation in elementary schools is characterized by general failure to comprehend the art implications involved. Insufficient emphasis is being given to art in the weekly and daily schedules; nor have the classroom facilities, equipment, and supplies been adequate. There has been a corresponding failure on the part of the teacher-training institutions to provide sufficient professional preparation in art for the elementary teacher.

In the secondary schools there is today recognition of the claim of art to the status of a minor, usually an elective subject, in both the junior and the senior high schools; art at this level has seldom been given the status of a major[1] subject co-ordinate with science, mathematics, and languages, and only in the rarest instances has provision been made for the housing, equipment, and supplies necessary for a satisfactory art program.

Proposed Improvement

Art education at all grade levels should enable the individual to adjust himself effectively to his environment, should function in his life and character as an integrating power, enriching his living; should help to motivate his interests and to clarify and organize his thinking. General education should afford experiences that will enable him to grow in his awareness of art, to become skilled in his ability to use the principles of design in controlling his environment and himself to the end that he may eventually become a desirable adult and citizen.

An increased emphasis will have to be placed on art as a curriculum area at the elementary school level, and time should be found for it in the weekly and daily time schedules. Classroom facilities, equipment, and supplies as well as instruction should be sufficient for carrying on an efficient art education program. Adequate professional training in elementary school art must be provided by the teachers colleges.

Students with unusual ability in art should be encouraged by their teachers, counselors, and school principals to enroll for an art curriculum, not to be confused with the other school curriculums in which art may also be offered as a major subject. It is not intended that the art curriculum replace these courses, the purpose of which is to offer immediate vocational training or to enrich the general secondary school offering. The art curriculum should be kept co-ordinate with the other general curriculums offered in the secondary schools, and it should not attempt to compete in any way with the special art school or college, but should aim rather to meet the general educational needs of those whose interests lie predominantly within the art field.

High School Art Major Courses

The art major course is planned for those students who, having some ability and a great deal of interest in art, elect it as a major subject in high school for two years with the intention of discontinuing their formal education in favor of a job on being graduated from high school or of pursuing a liberal arts curriculum in college. The immediate purposes of the art major courses include exploration of the possibilities of art as an immediate means of earning a livelihood upon leaving high school; making possible the pursuit of an additional cultural subject in high school; and improvement of everyday living standards through learning about the art needs of the home and community.

The time allotted to the usual art major course is one period in school and one period of homework for each school day. The elective art major courses suggested for eleventh-grade senior high school students include: "Art of the Ages," "Costume Design and Illustration," "Industrial Design," and "Freehand Drawing"; for twelfth-grade students: "American Art," "Advertising Art," "Stagecraft," "Interior Decoration," and "Modeling and Carving."

High School Art Curriculum

The art curriculum is planned for boys and girls capable of becoming high school graduates and of preparing for useful livelihood and entrance to college or art school where they will pursue art or art education as their major subject. Students with interest and unusual promise in art who desire to make an art profession their lifework are encouraged by their teachers, counselors, and school principals to

[1] A major subject is one which meets every school day, the passing of which is required for promotion.

enter the four-year high school art curriculum. Students should be admitted to this curriculum on the recommendation of the high school art teachers and the school principal.

It is proposed that all of the art subjects in this curriculum be pursued by all who enroll; the academic and related subjects to be included in it are variable, the student being allowed, in so far as possible, to elect subjects that will help him to be admitted to the higher institution which he may desire to enter. The art courses embraced by the curriculum are as follows: *ninth grade*, general art; *tenth grade*, painting and sculpture; *eleventh grade*, industrial art and commercial art; *twelfth grade*, architecture and theater art. The number of periods given to art in the junior high school is six a week; in the senior high school, two each day. Teaching assignments for art curriculum classes in the senior high schools are for two consecutive periods (a double period), preferably at the end of the school day.[2] Two periods of homework each day are required.

The art curriculum graduate is admitted and enthusiastically welcomed to both college and art school, it being understood that the student's grades in the subjects completed are sufficiently high to assure his success in the higher institution. The courses offered in the art curriculum are not intended to be immediately vocational but rather to furnish a sound background for future specialized training on the art school or college level.

The Preparation of Art Teachers and Supervisors

The need for professional educational preparation on the part of teachers should be met by effective curriculums offered in the art school and the college. The art education curriculum should be of four years' duration and should lead to the bachelor's degree, and summer school courses leading to this degree should be offered for those employed during the regular school term.

Physical Plan for a Complete Art Department

A standard housing unit consisting of an art classroom and an auxiliary room for a small school was described in detail in the specifications entitled, "Planning the Art Department," published in 1945 by the Related Arts Service.[3] Including any number of art housing units in a standard large school building should involve no unusual modification in the plans for the building, in which an exhibition area may be formed by placing the units opposite each other along the sides of a standard corridor, their respective display windows directly opposite each other. In a segregated building the width of the hallway should be increased to make possible the placing of one housing unit at the end of it, the corridor thus becoming virtually a school museum, illuminated by the fluorescent-lighted display windows and by similarly illuminated freestanding museum cases[4] centrally placed opposite the doors and blank walls. These cases are approximately 4 by 8 feet in plan and 6 feet high. Settees, instead of museum cases, are located opposite the display windows of the art classrooms. These are approximately 8 feet long and consist of two long benches built together back to back.[5] The plans for a complete art department should include a department office and a room of equal size for the storage of supplies and books. In a segregated building the needs for home economics, industrial arts, and science, as well as art, could be met by superimposing additional floors and by adapting the unit to the special requirements.

The art department in a particular building may, therefore, according to the size of the school, embrace but one art housing unit or multiples of the unit, a complete department in a differentiated high school, art school, or college, including units for such courses as those in general art, painting, sculpture, industrial art, commercial art, architecture, and theater art, respectively.

Special Equipment and Supplies

A minimum list of the items of furniture and equipment required for a general art housing unit in an elementary or secondary school having been given in the preceding publication, "Planning the Art Department," it will not be repeated here. The accompanying lists are rather for the art major and art curriculum courses offered in the high schools and for the professional art school and college courses. The lists are not intended to be exhaustive, but should be found sufficient to meet the initial and essential needs of the arts enumerated. Where general art must be included along with the assignment of a teacher to a particular art, certain items appearing in the list of special equipment will need to be supplemented with general items, such as the following: teacher's desk, common chairs, individual student art tables, worktables, stools, visual and miscellaneous equipment, as specified in "Planning the Art Department." The amount of equipment will in each case depend on the number of students to be provided for and the extent to which general equipment is used. In the lists that follow the number of items to be ordered for each art housing unit has been indicated for 12 pupils only.

Office Equipment

Chairs, straight, oak, teacher's, like those used throughout the building, one for each instructor in the department
1 Desk, teacher's, like those used throughout the building
1 Filing unit, consisting of three vertical filing drawers, 12⅜ inches high, 15¼ inches wide, and 24 inches deep, inside dimensions; on easy-running extension slides, to accommodate picture mounts 11 inches high by 14 inches wide. One index drawer at the top with three compartments for cards 3 inches high and 5 inches wide. Constructed of quarter-sawed white oak, finished like desk and chairs.
1 Board, adjustable, pine, 16 by 21 inches
1 Chair, swivel, with arms, oak
1 Pencil sharpener, automatic feed
1 Slide examiner, illuminated with frosted glass
1 Table, oak, conference, 36 by 60 inches, finished like desk and chairs.

Painting Equipment

12 Stools with round wooden tops, height over-all 30 inches, oak
1 Board, white pine, adjustable, 16 by 21 inches
Color charts, Munsell
1 Hue circuit, 22 by 28 inches, mounted
1 Value scale, mounted
1 Chroma scales for five typical hues, mounted
1 Display rack, floor model, oak, 6 feet; angle of tipping for display board 3 inches from vertical at the top
12 Easels, imperial, height 72 inches, hardwood
12 Easels, folding, height 66 inches, soft wood finish, for work out of doors
12 Plate glass, 9 by 12 inches, ¼ inch thick
1 Press, etching, with complete equipment
12 Sketch boxes for oil paints
1 Waste can, metal, 12 by 18 inches, with spring cover and foot treadle

Sculpture Equipment

12 Armatures, for human figure, 7 inches high with 5 by 7-inch base, 1½ inches thick
12 Armatures, for busts, 20 inches high (over-all) with 20 by 20-inch base, 2 inches thick
6 Calipers, sculptor's, outside, 18 inches long, boxwood and brass
6 Crocks, 10-gallon, earthenware, with wood or metal covers
2 Fireclay slabs, 1 by 10 by 10 inches
4 Fireclay slabs, 1 by 2 by 8 inches
1 Kiln, electric, firing chamber measurements 11 by 14 by 14 inches
12 Modeling stands, revolving adjustable top, three legs, hardwood
12 Stools, 30-inch, hardwood
24 Tools, modeling, boxwood, 8 inch, ball and blade, assorted
24 Tools, modeling, double-end, wire, 8 inch, assorted
12 Wheels, for modeling and decorating, 6-inch head

Industrial Art Equipment

1 Circular saw, small, with individual motor
3 Color charts, Munsell, for hue, value, chroma
6 Crocks, 10 gallon, earthenware, with wood or metal covers
12 Drawing sets, blackboard, wooden, consisting of one 24-inch T Square, one 36-inch straight edge, one 24-inch triangle, and one 15½-inch protractor
2 Fireclay slabs, 1 by 10 by 10 inch
4 Fireclay slabs, 1 by 2 by 8 inches
1 Kiln, electric, chamber 11 by 14 by 14 inches
2 Looms, four-harness, small size
12 Wheels, for modeling and decorating, 8-inch head
6 Plate glass, slab ¼ by 9 by 12 inches
1 Scotch tape dispenser, streamlined, heavy
1 Silk screen unit, complete with 11 by 14-inch and 16 by 28-inch printing frame, 10-inch and 14-inch squeegee, profilm, protective cream, fiber guides, paints, varnish, solvent, stencil filler, filler remover, brushes, knives, and tape
24 Stilts, fireclay, 1½ inch and 2½ inch, 12 of each size
24 Tools, modeling, boxwood, 8 inch, ball and blade form, assorted
24 Tools, modeling, wire, 8 inch, double end brass, assorted
1 Tool case, for woodworking and clayworking equipment

Commercial Art Equipment

1 Airbrush, complete with extra needle and self-centering tip in handle, reamer, color cup, hanger and hose coupling, funnel cups, jar, bottles and ⅛-inch air hose 12 feet long with couplings
1 Air compressor for airbrush
2 Angles, amber, 30 degrees and 60 degrees, 9 inch
2 Angles, amber, 45 degrees, 8 inch
3 Color charts, Munsell; hue, value, chroma
1 Cutawl machine, motor driven, complete with various cutters and wire for attaching to electric outlet
3 Display frames, 1½-inch natural molding, to take 22 by 28-inch showcards, with glass, button back, screw eyes for hanging
1 Display rack, floor model, oak, 6 feet; angle of tipping for display board 3 inches from vertical at the top
1 Floquil kit, complete with ½-ounce bottles of colored ink as follows: red, green, blue, black
6 Plate glass, ¼ by 9 by 12 inches
1 Scotch tape dispenser, streamlined, heavy
1 Silk screen unit, complete, as specified for industrial art

Architecture Equipment

12 Angles, amber, 30 degrees and 60 degrees, 9 inch
12 Angles, amber, 45 degrees, 8 inch
1 Blueprint machine, equipped with 3½ ampere mercury vapor tubes
3 Color charts: hue, value, chroma, color compass

[2] Scheduling the art period at this time makes possible museum visits and related field trips without interfering with the regular program of the school.

[3] "Planning the Art Department, Plans and Specifications for a Modern Art Unit," The Related Arts Service, 511 Fifth Avenue, New York 17, N. Y. Price, 10 cents.

[4] The Metropolitan Museum of Art, *Furniture Used by the Museum of Art*, New York, 1929, p. 12, Center Case (No. 514).

[5] *Ibid.*, p. 24, Gallery Bench (No. 181), with cupboard
[6] *Ibid.*, p. 24, Gallery Bench (No. 181), with cupboard

Students of the high school art curriculum class in architecture engaged in planning building facilities for the school art department of the future in Baltimore, Maryland.

1 Drafting machine, "Paragon," with 12-inch and 18-inch scales
1 Drawing board, 42 by 72 inches
12 Drawing instruments, in plush-lined case
1 Drawing set, blackboard, wooden, consisting of one 24-inch T square, one 36-inch straight edge, one 24-inch triangle, one 15½-inch protractor
1 Drawing table, 24 by 32 inches, softwood top
1 Drawing table, 31 by 42-inch top, softwood top, 1 13/16 inches thick
2 Horses, adjustable, hardwood
1 Light, adjustable, with fluorescent tube, for illuminating surface of large drawing table
12 Scales, architect's triangular
1 Scotch tape dispenser, streamlined, heavy
1 Shopwork bench, hardwood, with eight drawers, head and tail vises
12 Stools, architect's wood, with foot rest, wooden top, adjustable, 27 to 31 inches
12 T Square, amber, 30 inch
1 T Square, amber lined, 60 inch
1 Tracing table, illuminated

Theater Art Equipment

12 Angles, amber, 30 degrees and 60 degrees, 9 inch
12 Angles, amber, 45 degrees, 8 inch
1 Circular saw, small, with motor
12 Drawing instruments, set, in plush-lined case
12 Drawing tables, 24 by 32 inches, softwood top
6 Plate glass, ¼ by 9 by 12 inches, ground edges
1 Scotch tape dispenser, streamlined, heavy
1 Shopwork bench, hardwood, with eight drawers, head and tail vises
12 Stools, wood, with foot rest, nonadjustable, 30 inches, reinforced
12 T Squares, amber lined, 30 inch
1 Waste can, standard metal, 12 by 18 inches, with spring cover and foot treadle

Supplies

Quantities have not been indicated in the list that follows since the quantity in each case will be determined by local needs. The items which are deemed most necessary and which, therefore, should generally be considered first for purchasing have been marked with an asterisk.

Alcohol, denatured, in quart containers
Atomizers, folding, small, nickel-plated
Atomizers, hand pump type
Boards, academy: 12 inch by 16 inch, 18 inch by 24 inch
Boards, bookbinders, light gray, 25 pieces to package, size 10 by 12½ inches
Boards, drawing: 2 drawing surfaces, soft natural wood, 14 by 18 by ¾ inches and 31 by 43 by ¾ inches
Boards, Malfa Gesso, 18 by 24 inches
Boards, modeling, 9 by 12 inches, ¼ inch thick
Boards, mounting, 22 by 28 inches, light brown, light gray, and white, embossed surface
Bookbinder's linen, plain surface 36 inches wide; black; blue; brown, dark; brown, light; green; red
*Brushes, bristle, black, 12 inches over-all; ½ inch flat (medium soft for dry color); 1 inch flat (for paint and enamel).
Brushes, French bristle, white; ¾, ¾, 1, 1½ inches
Brushes, good grade white bristle, ¾, ¾, ¾ inches
Brushes, camel's-hair; No. 2 round (small); No. 4 round (medium); No. 7 round (large) ½ inch flat, 12 inches over-all (for dry colors); 1 inch (stroke), 8 inches over-all
Brushes, red sable: No. 7
Brushes, show-card: ½ inch single stroke, ox hair
Brushes, stencil: No. 6 round, ½ inch in diameter.
Canvas boards: Art school, 16 by 20 inches, 18 by 24 inches, 20 by 24 inches
Canvas cotton No. 8, studio stretching, heavy weight, 42 inches wide, 6-yard rolls
Chamois, thin, small pieces
Charcoal
  Soft, ¼-inch diameter, box of 25
  Medium hard, ¼-inch diameter, box of 50
Cheesecloth, bleached, 36 inches; 32 by 28 count (for bookbinding)
Clay, flour: natural, in 5-pound box
*Clay, modeling: in 1-pound package (plasticine), terra cotta; gray
*Clay, potter's, moist, 100-pound tub or box
*Cloth, airplane: tan, 36 inches wide
*Cloth, burlap: natural color, 36 inches wide, India
*Cloth, gingham, ⅛-inch check, 32 inches wide; blue and white; pink and white
*Cloth, monk's: natural, 36 inches wide
*Cloth, muslin, bleached, 36 inches, 56 by 60 count
Cloth, print, 36 inches wide, in pieces 3 to 10 yards in length, assorted colors, fast colors
Cloth, voile: 36 to 38 inches wide, blue, light green, pink, white, yellow
Colors, airbrush: Paasche moist water colors, 2-oz. jars: white, lamp black, sepia, vermillion, crimson lake, lemon yellow, ultramarine, sky blue, orange, Hooker green, mauve, burnt sienna
Compasses, complete with pencil
Cotton filler for rugs (roving) 4 fold, in 1-pound tubes or balls, approximately 140 yards; black, dark blue, light blue, medium brown, gray, dark green, light green, henna, lavender, old rose, orange, purple, red, tan, white, yellow
*Cotton, mercerized perle: 2-ounce tubes, No. 3 (medium); black, light blue, blue, light brown, gray, green, lavender, burnt orange, orange, rose, scarlet, white, yellow
Cotton, mercerized perle: 2-ounce tubes, No. 3 (large); black, blue, light blue, light brown, burnt orange, gray, green, lavender, orange, rose, scarlet, yellow
Cotton, raw, batting: 1-pound package
Cotton, spool: 150-yard spools; No. 40 white, No. 50 white, No. 40 black, No. 50 black
*Crayons, blackboard, colored, 1 dozen assorted to box: 1 black, 3 white, 1 blue, 1 brown, 1 green, 1 orange, 1 purple, 1 red, 1 yellow, 1 brown
*Crayons, pressed: eight in a plain metal box, red, yellow, green, blue, purple, orange, brown, black, about 5/16-inch diameter and 3½ inches long
Crayons, pressed: in bulk, about 5/16-inch diameter and 3½ inches long; black, blue, brown, burnt sienna, green, orange, purple
Crayons, wax, pressed: in bulk, approximately 7/16-inch diameter and 4¼ inches long; black, blue, brown, green, orange, red, purple, yellow
Dye: "Fabricolor," liquid, 1-ounce bottles; scarlet, orange, yellow, gold, brown, dark green, bluegreen, blue, dark blue purple, blue-black, jet black, rose, tan, white
Dye: Medium for "Gypsy," 2-ounce bottle
Erasers: Approximately 1¾ by 1 by ¾ inches, 40 pieces to the pound
Floquill kit, consisting of 6 Floquills, complete with nibs, 6 fillers, extra nib and plug, 6 bottles of Floquill, Dri-Ink bottle Floquill thinner, and solvent in wooden case 6¾ by 9 by 2¾ inches. Floquill, ink refills, 2-ounce bottles: blue, green, black, red, yellow, orange, purple. Floquill ink solvent and thinner, 2-ounce bottle
Frame, batik: No. 1, small, 18 by 18 inches

Frame, display: 1½-inch natural oak molding, to take mounting board exactly 14 by 22 inches, complete with glass and button back with screw eyes and wire for hanging. Also to take mounting board exactly 22 by 28 inches
Glue, in ½-pint cans
Hammers: nail, adz eye, 13 ounces, size No. 2
*Ink, drawing, waterproof, black, quart bottle
Ink, printer's; oil, 1- by 4-inch tube; black, blue, brown, green, orange, purple, red, yellow
Knives: stencil, ¼ by 1¼-inch blade
Leather, brown soft leather for tooling, 7 to 9 square feet per skin
Leather background tools: Craft Supply Co., numbers as follows: Nos. 14, 24, 19, single end; Nos. 1, 2, 3, double end
Linoleum, blocks, 5-ply, type-high, wood mounted; 1 by 1 inch; 1 by 1¼ inches; 1½ by 2 inches; 2 by 2 inches; 3 by 4 inches; 4 by 6 inches; 6 by 8 inches; 7 by 11 inches; 9 by 12 inches
Linoleum cutting tools: hardwood handle, complete with cutter, "Speedball." "V" veining tool No. 1, ⅛ inch, gouge No. 3, ¼ inch, gouge No. 5
Linoleum cutting-tool blades: to fit Speedball cutting tool handles above. "V" veining tool No. 1, ⅛ inch, gouge No. 3, ¼ inch, gouge No. 5
Linseed oil refined, 2½-ounce bottle (art)
Masking tape, brown or gray paper, with adhesive backing, reusable, 1 inch by 60 yards
Nails: wire, finishing, 1-pound cartons; ½ inch, No. 18; ¾ inch, No. 18; 1 inch, No. 18; 1¼ inch, No. 16; 1½ inch, No. 16; 2 inch, No. 14
Napkins, paper; white, size not less than 13 by 13 inches, 1000 to package
*Needles, chenille: No. 5, sharp points, 10 to paper, 1⅜ inches
Needles, raffia: No. 19, blunt, 10 to paper
Needles, tapestry: No. 20, blunt, 10 to paper, 1⅜ inches
Needles, weaving: steel, blunt 12 to the package, about 6 inches long
Oil, household: 4-ounce can
Oil, linseed: raw, in quart cans
Oilcloth, table: 46 inches wide, buff, green, white
*Paints, dry, color, deep tint, in 1-pound packages; black, blue, green, orange, purple, red, white, bright yellow, brown
Paints, enamel: ½-pint cans; black, blue, green, red, white, yellow
Paints, medium-grade, lead and oil, in pint cans: blue, black, red, white, yellow
Paints, oil, colors: 1 by 4-inch tubes; black, cobalt blue, emerald green, purple, red, vermilion, violet, white, bright orange, yellow
Paints, show-card, colors, 2-ounce glass jars, screw top; brown, black, dark blue, light blue, gold, dark green, emerald green, orange, purple (magenta), purple (mauve), dark red, light red, red-orange, silver, dark yellow, light yellow, white
Paints, show-card, colors, pint glass jars, screw tops; black, dark blue, light blue, gold, dark green, emerald green, orange, purple (magenta), light red, red-orange, dark yellow, light yellow, white
Paints, stain (wood dye), in quart jar; dark oak, dark mahogany
Paints, varnish, spar, quart cans
*Paints, water-color, semimoist, in pans; four colors — red, yellow, blue and black — in metal box, with No. 7 brush, full-size pan
Paints, water-color: refills, semimoist, in bulk, full-size pan (for eight-color box), black, blue, brown, gold (pale), green, purple, red, silver, white, yellow
Paints, water-color: refills, semimoist, in bulk, full-size pan (for four-color box), black, blue, red, white, yellow
Palettes, water-color, 16-well metal
*Pans, water-color: lacquered, 3¾ inches diameter, ⅜-inch deep
Paper, aluminated: coated metal sheets, size 10 by 12 inches; bright gold, bright silver
Paper, bogus: 12 by 15 inches, 400 sheets to package
*Paper, cover: 500 sheets to package, assortment of 80 sheets each of brown, green, red, blue, orange; 50 sheets each of black and gray; size 9 by 12 inches, 12 by 18 inches
*Paper, cover: 20 by 26 inches, rough "antique" finish; black, blue, dark brown, light brown, buff; gray; green, orange; red
Paper, crepe: in folds, 20 inches by 10 feet; black, light blue, medium blue, medium green, orange, deep pink, red, white, canary yellow
*Paper, detail: 48 inches wide, 25 yards to roll
Paper, drawing: light-gray, semirough surface, 500 sheets to package; 9 by 12 inches, plain; 9 by 12 inches, squared ruling, ¼ inch
*Paper, drawing: light-manila color, semirough finish, 500 sheets to package; 9 by 12 inches, 14 by 20 inches, 22 by 30 inches
*Paper, drawing: white, semirough surface, 500 sheets to package; 9 by 12 inches, plain; 9 by 12 inches, squared ruling ¼ inch; 12 by 18 inches, plain
*Paper, Enginex: 9 by 12 inches, 500 sheets to package; black, blue, blue-green, brown, yellow-green, orange, yellow, red, red-purple, purple, purple-blue. Assorted, 90 sheets each of red, orange, brown, green and blue, and 50 sheets of black
Paper, Enginex: 9 by 12 inches: Assorted, 10 sheets each of light yellow, yellow, dark yellow, gray-yellow, yellow-orange, light orange, dark orange, gray-orange; 20 sheets orange; 10 sheets each of light red-orange, red-orange; 5 sheets each of light red, dark red, gray red; 25 sheets of red; 20 sheets of red-violet; 10 sheets each of light blue, dark blue, gray-blue; 40 sheets of blue-green; 10 sheets of light green, green, dark green, gray-green; 40 sheets of yellow-green; 30 sheets of brown; 10 sheets each of white and gray; 60 sheets of black
Paper, Enginex: 20 by 26 inches; black, blue, brown, gray, neutral, green, orange, purple, red, yellow
Paper, label: 20 by 26 inches; gold silver
Paper newsprint: plain, 500 sheets to package; 8½ by 11 inches, 8½ by 13 inches, 18 by 24 inches
Paper, project: "Back-Ground," in rolls 18 inches wide, 16 yards to roll; black, dark blue, light blue, medium blue, chestnut brown, gray, green, olive green, manila, white
Paper, project: "Textone," in rolls 18 inches wide, 16 yards to roll; dark red, middle red, dark yellow-green, turquoise blue, purple-blue, dark red-violet, dark green, dark blue-violet, yellow-orange, middle blue-green
Paper, stencil: 9 by 12 inches, 100 sheets to package
Paper, tape: gummed inside, 1 inch wide, 800 feet to roll
*Paper, wrapping, kraft: 24 by 36 inches, soft fold, quire to package; 24 by 36 inches soft fold, in quires, 480 sheets to package; 18-inch roll, 9 inches in diameter; 24-inch roll, 9 inches in diameter; 36-inch roll, 9 inches in diameter
*Paste: for general use, in quart jars, gallon jars
Paste: "Sphinx," in pint cans
Pencil sharpener: for beginner's pencils (large lead)
Pencil-sharpener knives: for "Marvel" or "Giant" pencil sharpeners
Pencil sharpeners: for standard-size pencils
Pencils: beginner's, large lead
Pencils: student's, No. 2 lead
Penholders: Student's, for general use
*Pens, lettering (Speedball type): square, large A 1; square, medium A 3; small A 5; round, large B 1; round, medium B 3; round, small B 5
Pens, student's for general use
Pins: brass, 3½ inch, 160 to paper
Plastic wood: 1-pound cans
Plastic wood solvent: 8-ounce cans
Punchers: conductor's, ¼-inch round hole, spring handle
Rollers: printer's, 6 inches long, 1¾ inches in diameter, complete with handle
Rules: maple, 12-inch, plain edge, beveled — graduations of ⅛, 1/16, ¼, ½ inch
Sand: white, bleach, 100-pound bags (for sand table)
Sandpaper: 9 by 11 inches, quire to package; No. 20, No. 0, No. ½, No. 1
Saw blades, coping, pin ends, dozen to package, 6 by 3/32 inches
Saw, coping, wire frame for pin pattern blades
Saw, fret, 8 inches deep, wood handle
Saws, compass, 12 inches
*Scissors: 5-inch over-all length, one sharp, one blunt point
Screw eyes: No. 12, gross to box (3/16 inch)
Screws: flat head, bright wood, gross to box; ½ inch, No. 4; ⅝ inch, No. 6; ¾ inch, No. 6; ¾ inch, No. 8; 1½ inches, No. 8; 1½ inches, No. 12
Shellac, white, in pint bottles
Silk-screen supplies:
Adhering liquid (silk-screen stencils) No. 22 for Nu-film, gallon container; adhering liquid (silk-screen stencils) No. 30 for Blu-film, gallon container; bronze, gold, pale gold silk-screen lining, pound package; bronzing, liquid 1 qt. container; extender, base, 1 gal. container; film (for silk-screen stencils) per sheet size 30 by 40 inches; Pro-film, sheet; Nu-film, sheet; Blu-film, sheet
•Knife, chest XActo No. 82-X (contains 3 XActo knife handles and 12 assorted blades) set
Knives, Pausche swivel (for stencils of film)
Paints, paste, silk-screen process, quart containers: Toluidine red, Strontian yellow, ultramarine blue, medium green orange, brown, purple, black, white
Remover, film (or lacquer) for silk-screen process, gallon containers
Retarding varnish, for silk-screen process, gallon containers
Silk (for mending screens): 40 by 36 inches
Squeegees, for silk-screen process: 6 inch, 8 inch, 12 inch, 14 inch
Transparent base, for silk-screen, gallon containers
Varnish, overprint, for silk-screen, gallon containers
Slides, projection lantern, materials for making:
Radio mats, 3¼ by 4 inches, complete with cellophane and red carbon, 50 to box
Glass, plain, size 3¼ by 4 inches for radio mats
Glass, etches, size 3¼ by 4 inches for drawing and writing
Binding strips, 50 to package
Snips: tin, 2½-inch straight cutting edge
Sponges, small
Tagboard: 22½ by 28¼ inches
Tape, transparent cellulose "Scotch" 3 inch core ½ by 2592 inch roll (perishable material)
Thumb tacks: steel, solid, ¾ inch, 100 to box
Towels: paper, flat, 150 to package
Try squares: 8-inch blade
Turpentine, quart containers
Turpentine, rectified spirits of, 1-gallon containers
Twine: Sea Island, 1½-ounce balls; blue, brown, green, orange, red, yellow
Warp thread: 4-ply carpet warp, ½-pound tube; black, blue, brown, ecru, green, olive, red, white
Wax: Batik, in ¼-pound cakes
Wire: picture, stranded, 12 strands, No. 2 retinned, 25 feet to roll in paper box
Wood: ¼-, ½-, ¾-, 1¼-inch basswood, in various widths
Wood: ½-inch oak, in various widths
Wood: blocks, 3 by 3 by 5 inches long (for carving only)
Wood: dowels, birch or maple, 3-inch lengths: ¼, ½, ¾, 1 inch
Wood: soft, clear of knots, surface on two sides; pieces in 6-foot lengths: 1 inch wide by ¾ inch thick; 6 inches wide by ¾ inch, by ½ inch by ¾ inch; 8 inches wide by ½ inch; 3 inches wide by ¾ inch thick; 5 inches wide by ¾ inch
Wool: heavy rug, yard, threefold, 4-ounce skein; black; clear blue, dark blue, blue-green, greenish blue, brown, medium brown, gray, dark green, orange, oxford, purple, red, red-brown, rose, scarlet, violet, yellow, yellow-brown, yellow-green
Wool: knitting, fourfold, 4-ounce skein, 250 to 275 yards; black, dark blue, light blue, medium blue, brown, gray, dark green, light green, medium green, burnt orange, dark purple, light purple, dark red, light red, red-orange, tan, white, yellow, yellow-orange
Wool: Scotch tweed, four-ply mixtures, 4-ounce hanks: 302, tan and rust; 301, beige and brown; 303, gray, black, blue; 304, gray and black; 306, light and dark green and black; 305, gray and black
*Yardstick: graduated in ⅛ inch with brass ends and eyelets

Conclusion

The purpose of art in the school curriculum is vastly more than that of an area merely embracing mediums and processes, for it involves not only activities but experiences with information as well, and with feelings. Art education must become an organized body of educative and self-controlled experience directed toward the meeting of personal, national, and world needs. Even more perhaps than other curriculum areas, art must function as a democratic way of living, contributing directly to world solidarity and a lasting peace.

Greater attention must be given to the professional preparation of teachers and the providing of effective supervision, especially at the elementary school level. Essential housing, equipment, and supplies must be provided. There must be realization of the need for general art courses for all pupils in the junior and the senior high schools, for major courses in art, and an art curriculum for the gifted pupils. There must come the consciousness on the part of the high school administrator that art is as "preparatory" a subject for students who will enter college as it is for those who are compelled to terminate their formal education on graduation from high school. There must come the recognition of the claim of art to a position of importance in the curriculum identical with that now held by the languages, mathematics, and science. If a head of department is designated for other subject-matter areas, then a head of department should be designated for the art department, which should be regarded as in every way co-ordinate with the other major educational fields.

There must come an awakening on the part of school administrators to the realization that art is entitled to a place of major importance in the curriculum at all grade levels.

Testing and Tests

FINAL EXAMINATION — MECHANICAL DRAWING I

ANTHONY CALENDAR
Eastchester High School
Tuckahoe, N. Y.

PART I

(Maximum, 25 Credits)

Directions: Read carefully, then mark a *T* or *F* in front of each statement according to whether it is true or false.

( ) 1. Mechanical drawing develops the constructive imagination and the habit of exact thinking.
( ) 2. The study of mechanical drawing is important to any future engineer or architect.
( ) 3. Mechanical drawing is a new language.
( ) 4. Accuracy is unimportant in the making of working drawings.
( ) 5. Working drawings are used extensively by mechanics and builders.
( ) 6. A horizontal line is perpendicular to a vertical line.
( ) 7. A 45-deg. line is perpendicular to a 60-deg. line.
( ) 8. A 60-deg. line is perpendicular to a 30-deg. line.
( ) 9. Construction lines are removed after a drawing is completed.
( ) 10. Many working drawings consist of three views.
( ) 11. The top view of a working drawing is placed below the front view.
( ) 12. The side view may be drawn to the left or to the right of the front view.
( ) 13. The top view and the side view of an object always show the width.
( ) 14. The front view and the side view always show the length of an object.
( ) 15. The measuring instrument used by the draftsman is called a ruler.
( ) 16. In the drawing of a section the invisible lines are omitted.
( ) 17. The section lines indicate the kind of material that is used.
( ) 18. A section view is sometimes necessary in order to show construction detail.
( ) 19. Location dimensions are required in order that the different views of an object may be properly placed on the paper.
( ) 20. Location dimensions are omitted on a completed working drawing.
( ) 21. A working drawing is not complete unless it has dimensions.
( ) 22. Always give the radius of a circle when dimensioning same.
( ) 23. Always give the diameter of an arc when dimensioning same.
( ) 24. Dotted lines show invisible edges of an object shown on a drawing.
( ) 25. Lettering is of very little importance in mechanical drawing.
( ) 26. Height of lettering and dimensions on working drawings is ⅛ in.
( ) 27. Arrowheads are v shaped and about 3/16 in. in length.
( ) 28. An arc tangent to line touches that line at only one point.
( ) 29. Hidden edges are represented by dashes ⅛ in. long with about 1/16-in. space between.
( ) 30. When giving the radius of an arc the arrowhead is omitted at the center.
( ) 31. Extension lines are light lines extending between views but not touching the views.
( ) 32. Vertical and horizontal object lines are heavy lines drawn with either the triangles or T square.
( ) 33. A dimension line is a light line with arrowheads at its extremities.
( ) 34. Over-all dimensions are not necessary on working drawings.
( ) 35. An assembly drawing shows all parts put together, or assembled.
( ) 36. A detail drawing shows each piece drawn separately and dimensioned.
( ) 37. When an object is too large to draw full size on the regular drawing paper it is drawn on a larger sheet.
( ) 38. Scale ½ in. = 1 in. and 6 in. = 1 ft. 0 in. are identical.
( ) 39. Scale ¾ in. = 1 in. and 9 in. = 1 ft. 0 in. are identical.
( ) 40. An isometric drawing has three axes: a vertical, a 30-deg. to the left, and a 30-deg. to the right.
( ) 41. An isometric always shows two views of an object.
( ) 42. Hidden edges are omitted in an isometric drawing.
( ) 43. Circles in isometric drawings have two centers.
( ) 44. Arcs in isometric drawings are drawn from the intersecting point of perpendiculars drawn from the points of tangency.
( ) 45. The point on your pencil should be at least ⅜ in. in length and always well pointed.
( ) 46. In drawing circles it is not necessary to have both a vertical and a horizontal center line.
( ) 47. An expert letterer does not need any guide lines whatsoever.
( ) 48. The ability to letter well can be acquired only by persistent and careful practice.
( ) 49. There is exactly the same amount of space between each letter in a word.
( ) 50. The T square should never be dropped because it may be damaged.

For extra credit: Describe the exact procedure one follows in the making of a blueprint.

PART II

1. The object dimensioned in Figure 1 violates certain principles of dimensioning learned in mechanical drawing. Dimension the figure as you know it should be done.

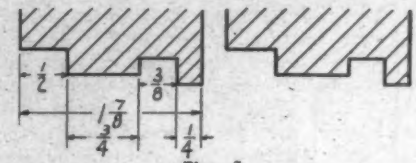


Fig. 1

2. Dimension properly the ¾-in. circle and the ½-in. arc shown in Figure 2.

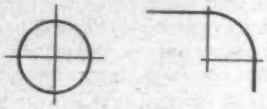


Fig. 2

3. The drawings shown in Figures 3 and 5 are incorrectly dimensioned. Dimension the drawings in Figures 4 and 6 as they should be done.

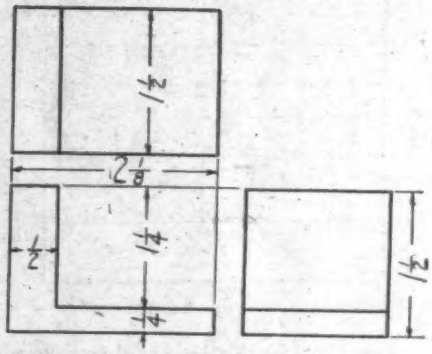


Fig. 3

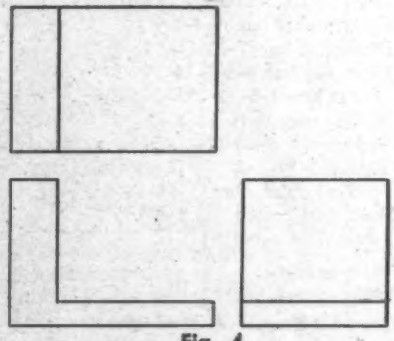


Fig. 4

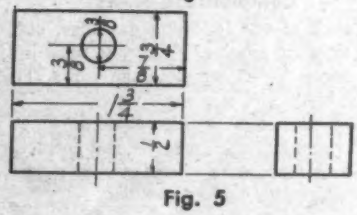


Fig. 5

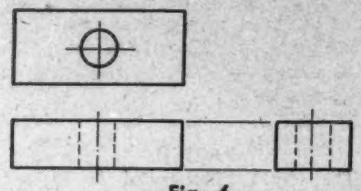


Fig. 6

4. Draw circles (freehand) in the isometric squares shown in Figure 7. All construction lines are to remain.

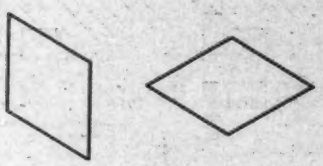


Fig. 7

5. *Blueprint reading:* To the right of each item are four numbers indicating parts of the drawing below. Encircle that number which is the correct one for each particular item.

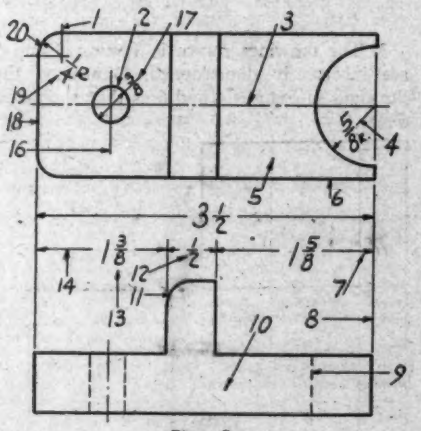


Fig. 8

Example: Item X. Arrowhead is followed by 2–6–(7)–20. Number 7 is correct.

A. Construction line 1–4–7–9
B. Dimension line 7–20–14–13
C. Extension line 6–8–7–16
D. Object line 7–6–17–15
E. Hidden edge 9–11–12–3
F. Top view 6–5–10–12
G. Radius 3–19–1–7
H. Over-all dimension 15–14–18–5
I. Horizontal center line 1–5–3–6
J. Front view 8–9–10–11

PART III

(*Maximum, 25 Credits*)

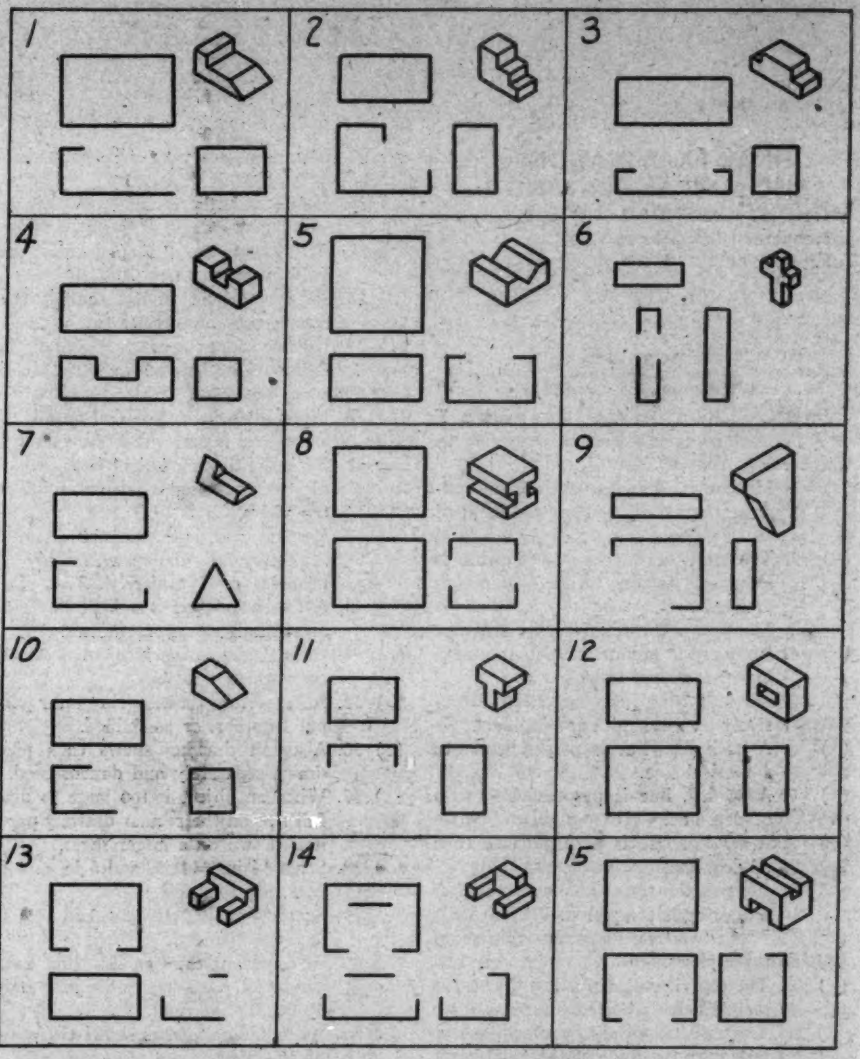
Complete the Views

In each of the following drawings, one or more lines are missing. You are to draw in the lines necessary to complete the views. There will be hidden lines in some views.

No partial credit will be allowed.

All views must be complete and correct.

It would be an excellent idea to work out the problems on scrap paper first.



TEST FOR DRAFTING ROOM

W. C. FORD
Supervisor
Training School
Glenn L. Martin Company
Middle River, Md.

I. Identify the following abbreviations.

1. a. c.	14. d or dia.	27. lb.	40. r.p.m.
2. aero	15. dim.	28. lb./sq. ft. or psf
3. alum.	16. dwg.	29. lb./sq. in. or psi
4. amp.	17. emf.	30. l.h.	41. sq.
5. B/M	18. ft.	31. M	42. std.
6. B/P	19. ga.	32. mac.	43. sw.
7. brg.	20. hdn.	33. max.	44. tan
8. c'bore	21. hex	34. m.p.h.	45. thd.
9. c'drill	22. h.p.	35. mtg.	46. thru
10. cg.	23. i.d.	36. o.d.	47. v
11. cm.	24. ign.	37. r or rad.	48. vol.
12. c'sink	25. in.	38. r.p.s.	49. wt.
13. d. c.	26. kw.	39. r.h.	50. yd.

II. Draw the following conventional lines as they should appear on drawings and indicate weight of lines (heavy, medium, light, etc.).

1. Visible lines
2. Hidden lines
3. Center lines
4. Phanton lines
5. Cross section lines
6. Dimension and extension lines
7. Cutting plane lines
8. Short break lines
9. Long break lines

III. Draw the following conventional section lining in ⅝ by 1-in. blocks.

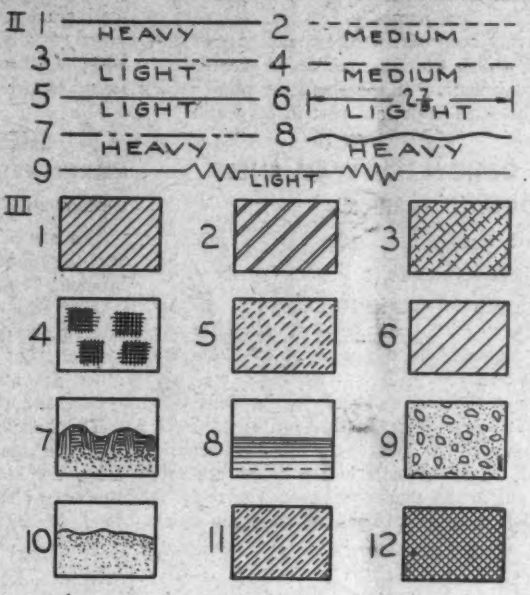
1. Cast iron
2. Steel and wrought iron
3. Aluminum alloy
4. Wire mesh
5. Glass and porcelain
6. Stone or brick masonry
7. Earth
8. Water and other liquids
9. Concrete
10. Sand
11. Bronze or brass
12. Babbitt and alloys

KEY

I.

1. alternating current
2. aeronautical
3. aluminum
4. ampere (s)
5. bill of material
6. blueprint
7. bearing
8. counterbore
9. counterdrill
10. center of gravity
11. centimeter

12. countersink
13. direct current
14. diameter
15. dimension
16. drawing
17. electromotive force
18. feet
19. gauge or gage
20. hard or harden
21. hexagonal
22. horsepower
23. inside diameter
24. ignition
25. inch (es)
26. kilowatt
27. pounds
28. pounds per square foot
29. pounds per square inch
30. left hand
31. magnaflux
32. mean aerodynamic chord
33. maximum
34. miles per hour
35. mounting
36. outside diameter
37. radius
38. revolutions per second
39. right hand
40. revolutions per minute
41. square
42. standard
43. switch
44. tangent
45. thread
46. through
47. volt (s)
48. volume
49. weight
50. yard



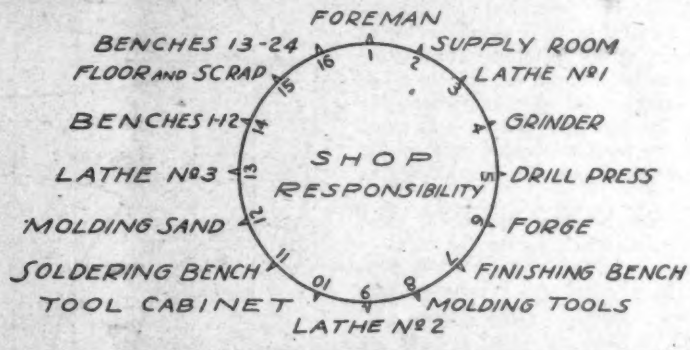
Problems and Projects

PUPIL RESPONSIBILITY

CLARENCE R. WOOD
Lakewood Junior High School
Long Beach, Calif.

Many educators hold that personality integration and social adjustment are of as much importance as the teaching of the 3 R's. They maintain that without the ability to adjust himself and the ability to adjust to the conditions in which he finds himself, the individual cannot attain satisfaction in later life, despite his ability to learn and retain subject matter. It is then one of the obligations of the modern school to provide situations whereby the child may develop his ability to make the necessary adjustments and be helped to overcome any difficulties that may arise during the period of learning in both personal and social problems.

Another concern of the schools should be to equip the young pupil with the practical skills needed to fit him for taking his place as a self-sustaining successful individual in our present competitive commercial world as well as to enable him to be a useful citizen of service to society at large. Most important of all perhaps is that the school must help the pupil to attain that feeling of satisfaction and accomplishment which every individual feels when he has successfully met a baffling situation.



Shop responsibility chart

To create a situation in which the pupil may begin the adjustment process, the pupil must be made to see the need of co-operation and community effort and must be helped to differentiate between emotions which spring from a self-centered type of social behavior and those which spring from a genuine desire for the welfare of the group. Such concrete situations as games, tools, acting, and care of group property offer fertile ground for engendering the co-operative spirit.

If the child is to feel that he is part of the world and its complex problems, he must be permitted and urged to take part in all the planning and discussion. He must create his own world just as the adult makes and creates his. Ways of building this feeling among pupils is to permit them to discuss problems which lead to the setting up of real life situations.

During the period of adolescence wherein the school attempts to provide expanding experiences of an exploratory nature for all the pupils, the industrial-arts shop becomes an excellent place to develop real life situations and to assist the pupil in his personal and social adjustments. Industrial arts is a phase of general education that concerns itself with the materials, processes, and products of the manufacturer, and with the contribution of those engaged in industry. Learning comes through the pupil's experience with tools and materials and through his study of resultant conditions of life. It is a curriculum area rather than a subject field.

One way which has been devised to develop a real life situation in which the pupil participates is the shop responsibilities activity. This plan is not new but has so many educational possibilities that it is the basis of this article. The following plan is used in Lakewood Junior High School, Long Beach, Calif.

The responsibility chart is one which is prepared by the pupils with guidance on the part of the instructor. Although the plan is devised for pupils of junior high school age, several elementary school teachers have expressed the belief that the plan would also accomplish the objectives on the elementary school level. The chart is prepared in the following manner.

Near the beginning of the semester a film is shown the classes which concerns itself with shop safety and organization. This film brings out the important reasons for safety and results if proper safety rules are not observed. Also and more related to our subject, the film shows both school and industrial shops with each in operation, showing the practices observed in industry today. After the film is shown the instructor initiates open discussion on the part of the pupils, making suggestions and guiding the discussion so as to avoid waste of time and the injection of unrelated material. Students wish to organize their shop along the lines observed in the

picture with many excellent exceptions. These points are listed and grouped according to their location in the shop.

The next step is the preparation of some means to accomplish each point or task that has been listed. The instructor enters the discussion only when necessary to clear up a point or state a policy which must be observed. As the pupils observe the principles brought out in the film, they arrive at the decision that the shop can be maintained on the desired level by each having a task or responsibility to accomplish during the cleaning up period with the exception of the foreman who should be the supervisor during the entire period.

To permit each pupil in the class to do each task at least once during the semester and permit the foreman to have a chance to work on his projects, a plan of rotation on a weekly basis is most generally suggested by the pupils. This permits each student to supervise every other student in the class for an entire week and also affords each boy with an opportunity to exercise his abilities on each task as suggested by the class.

The last rung in the ladder is to devise a chart which will permit the plan as worked up by the pupils to be observed and read without question by all the pupils in the class. The illustration shows a suggested chart. By rotating the center wheel each week the pupils know their responsibility by looking for their assigned shop number.

Through the operation of this responsibility plan a real life situation exists. The pupil may develop his ability to make adjustments and be helped by the instructor to overcome difficulties that may arise during the period of adjustment to both personal and social problems. The pupil learns in a situation where the community and co-operative spirit is paramount, learns to discover the difference between self-centered and co-operative forms of community life and feels that he is as much a part of the problems which exist in the shop as any other individual including the instructor.

Just how does this shop responsibility chart create situations which causes the pupil to observe and learn all these things? Psychologists have stated that pupils in adolescence are required to make more adjustments both personal and social than at any other period in normal life. By creating a situation where the instructor may observe a pupil in the supervision of other pupils over a period of a week's time the instructor is enabled to determine whether the student has been able to adjust himself to the reactions of his fellow pupils.

The second point mentioned is that of a learning situation where co-operative and community spirit is desired. Pupils realizing that if each did as he pleased in the shop very little would be accomplished, suggest this type of spirit at the beginning when the chart is developed.

Through their contact with other students during the cleanup period, as well as in other shop activities, each boy becomes acquainted with the difference between self-centered and co-operative individuals and the same form of community life even though he may not call them by these names.

Having been permitted to take part in devising a plan which he realizes is essential to the continuation of the shop, the pupil feels that he is an important part in his world.

DESIGN FOR WALL SHELF

W. DONALD LARRICK
High School
Pickerington, Ohio

The pair of wall shelves shown in the accompanying illustration is well suited for use in a course where the elements of design are being discussed.

The outline of the back of the shelf is a modified fleur-de-lis. In this outline is placed a cross with the ends of the members slightly flared. These elements of the design are carried out in the shelf and brace. The result is a satisfying group of lines and masses in which the cutout spaces are as interesting as the main body of the design.

The shelves illustrated were made by a tenth-grade student. He used curly walnut, resawed to ¼ in., assembled the pieces with glue, and gave them a finish of one coat of walnut stain and two coats of boiled linseed oil.

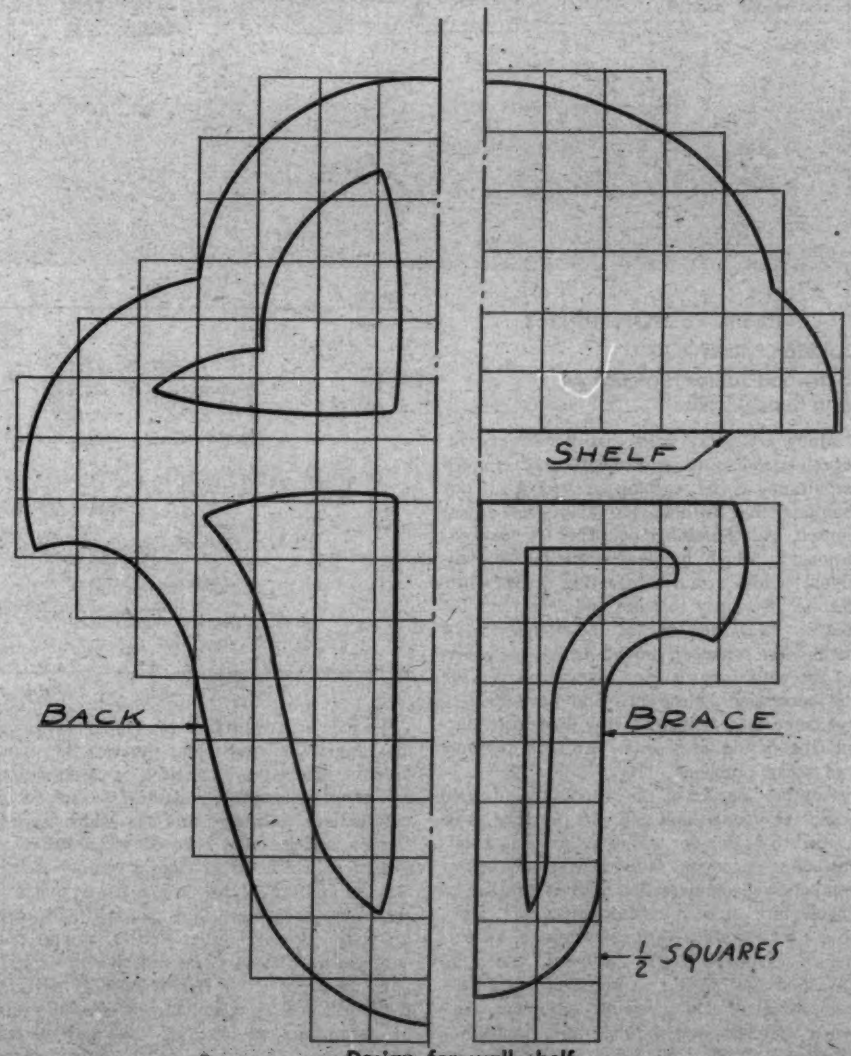
SHEET-METAL SCOOPS

MARTIN PETERSON
Cincinnati, Ohio

The scoops shown in this article are fine for the flour and sugar bins in mother's kitchen. The scoops can be made larger or smaller than those shown in here, merely by altering the dimensions.

One type is the flat-bottom scoop. The other has a curved bottom. Each of these types have their own particular advantages.

The handles shown on these scoops take up little space, yet they make it easy to grasp the scoop. Do not lacquer or enamel the scoops that are to be used for handling food. Make the scoops to be used for food



Design for wall shelf

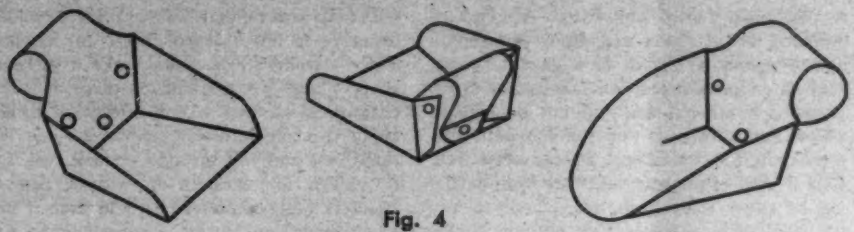


Fig. 4

out of tin plate. Galvanized sheet metal may be used for other scoops.

1. Develop the pattern.
2. Cut out the pattern.
3. Fold it into shape.
4. Obtain a piece of sheet metal large enough to cut out the blank.
5. Trace the pattern onto this metal.
6. Cut out the blank.
7. Bend the bottom at right angles to the

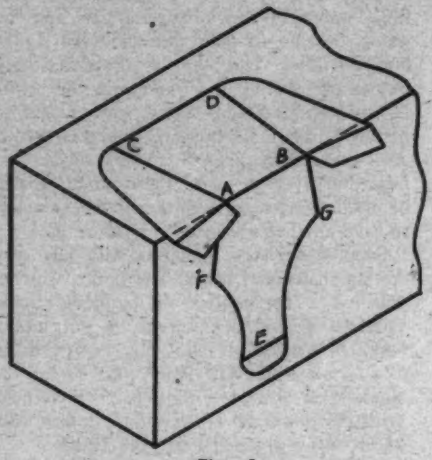


Fig. 1

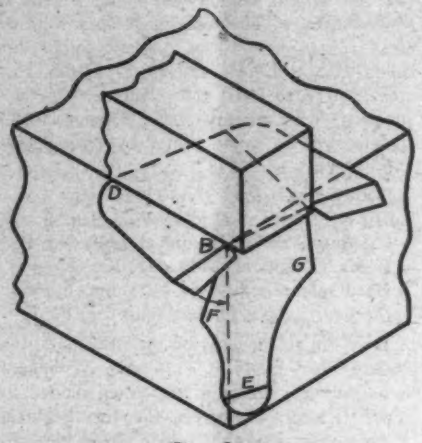


Fig. 2

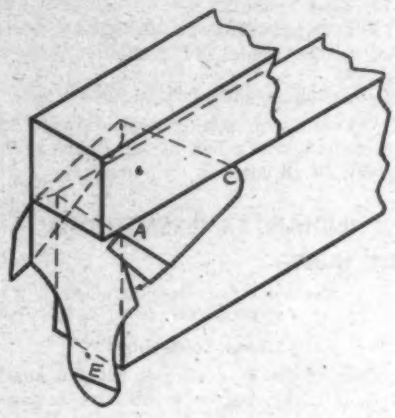
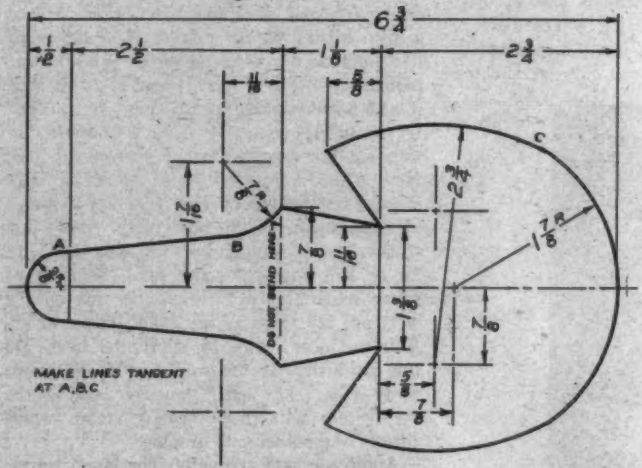
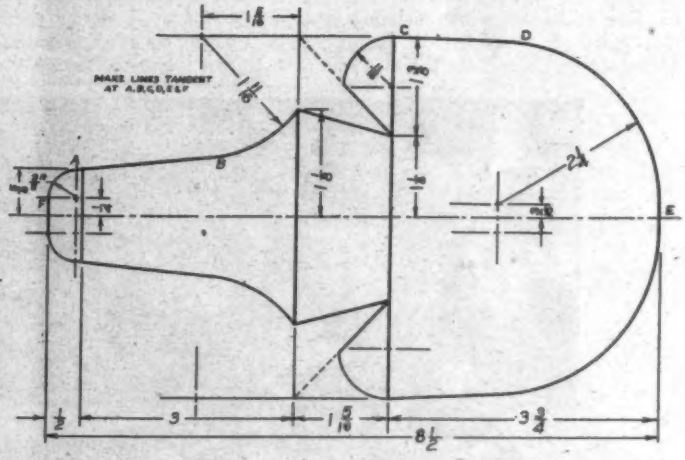


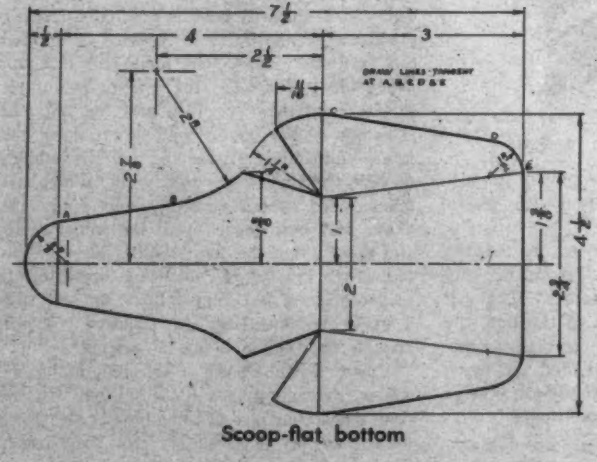
Fig. 3



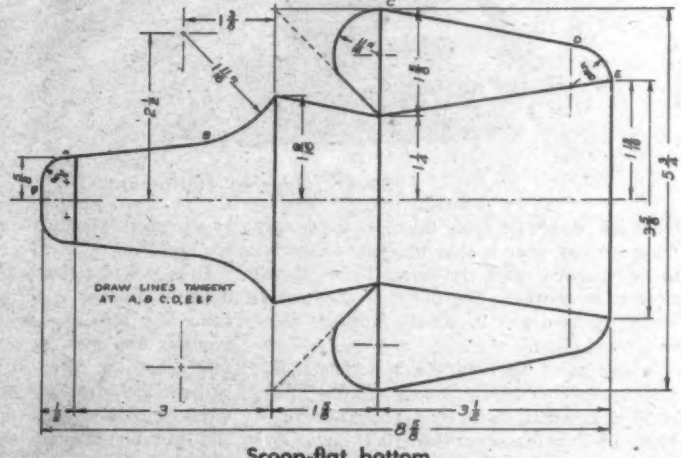
Scoop-curved bottom



Scoop-curved bottom



Scoop-flat bottom



Scoop-flat bottom

back as in Figure 1. Bend it first with the palm of the hand, then tap it lightly with a mallet. It is best to do the bending over a metal edge.

8. Bend at line *B-D* as shown in Figure 2.

9. Bend at line *A-C* as shown in Figure 3.

NOTE: Steps 8 and 9 are not needed when making curved bottom scoops. Shape the curved sides by hand over a round stake.

10. Bend the laps into position.

11. Fasten with tinners, tinned rivets.

12. Bend handle at *E*.

13. Turn handle over a round stake or dowel stick to the shape and position shown in Figure 4.

14. Fasten handle with a rivet.

15. Polish with steel wool and round off the corners with a fine file or emery cloth. Smooth off all edges in the same way.

INDIAN SILVERSMITHING

BEN. HUNT

(Continued from page 82 of the February, 1947, issue)

Silver Soldering

Silver soldering, until you get the knack of it, is tricky, but once you have acquired the knack your troubles will be over. Cutting out, sawing, bending, and forming can all be done at leisure, while soldering is a job that must be completed in one operation. There are as many "don'ts" to soldering as there are "do's." Probably the most important thing to remember is that the joint or parts to be soldered *must* be clean. There is no alternative to that. The parts of the metal where the solder is to adhere must be filed or scraped clean.

A flux must be used for soldering silver just as is done when joining tin or other sheet metals with soft solder. There are many kinds of flux for silver soldering. Some are better than others. The most commonly used is just plain borax and water. A lump of prepared borax, purchased from the supply house, should be placed in a glass of clear, cold water for about ten minutes before using. Borax is a mineral and will not dissolve in water, but a thick or thin solution of it suspended in the water will answer very well. Flux is used to prevent the silver from oxidizing as silver solder will not adhere to any oxidized surface, regardless of how much heat you apply. Neither will solder adhere to greasy surfaces. The joint must be absolutely clean. The author found a silver solder flux called Handy Flux[1] very easy to use. This comes in paste form and when used in conjunction with Handy and Harmon silver solders, will be found useful by both novice and expert.

Handy flux is fluid at 1100 deg. F.
"Easy" solder is fluid at 1325 deg. F.
"Medium" solder is fluid at 1390 deg. F.
Borax is fluid at 1400 deg. F.
Hard solder is fluid at 1425 deg. F.
Sterling silver is fluid at 1640 deg. F.

Easy-Flo solder, sold by the firm marketing Handy Flux, melts at 1175 deg. F. Since it is not silver white, it is not recommended for jewelry work. However, for the beginner, it is a very workable solder. It is ideal for camps or beginners' classes, or can be used for a last soldering operation where there is danger of other soldering joints loosening up. The slightly yellow color can only be detected by an expert. Handy Flux is used with "Easy-Flo" solder.

Silver soldering equipment

It is well for the beginner to try out the different solders and fluxes before actually doing any soldering on a project. That will acquaint him with the action of the flux, the solder, and the silver. It is quite discouraging to have the silver all cut and filed and fitted nicely and then spoil the whole job in the last operation, namely, the soldering.

[1]Handy and Harmon, 82 Fulton St., New York City.

It may also be well before trying to solder, to make a few *raindrops* just to see how easily sterling silver melts. Take a piece of silver about ⅛ in. square, place it on a charcoal block, put a drop of flux on it, and apply the flame. It will quickly become red, then melt and roll up into a small ball. Let it cool a bit, pick it up with a pair of tweezers (copper preferred), and drop it into a small dish of pickle—¼ sulphuric acid to ¾ water. (When mixing the acid and the water, be sure to pour the acid very slowly into the water. You may be burned seriously if you try pouring the water into the acid.) It will be white and round with a slightly flattened base. The thing to notice is that it does not require a great amount of heat to melt the silver. A lot of these raindrops will be needed later to decorate Indian jewelry, so save all that are made for future use.

Suppose we start soldering with any easy flowing solder and borax. The borax, whether you use a borax stick or powdered borax such as is used in kitchens, is put into a borax slab made of slate. Place a few drops of water into the slab depression and rub the borax stick around until a paste is formed. With the powdered borax, simply mix it with water, using a camel hair quill brush.

Place a piece of silver about 1 by ½ in. on the charcoal block and with the brush place a drop of flux on the middle of it and work it around. If it creeps, the silver is not clean; perhaps it is a bit greasy. Clean it by rubbing it with powdered pumice or crocus cloth. Then try again. If you have done a good job of cleaning the flux will stay where it is put. Now place a ½- by ¼-in. piece on edge across the larger piece. File it so that it stands at right angles to the base piece. Apply flux to the bottom edge and up the sides for 1/16 in. or so. Now cut some small snippets of silver solder, place them in the flux on the slab and lay them at the joint. Two will do. You are now ready to apply the heat. Do this gradually. If the solder suddenly jumps away from the joint, you are heating the metal too fast, thus forming steam which throws the solder out of place.

Apply the heat gradually. The larger pieces, in all soldering operations, must be given the same amount of heat as the smaller pieces. This can be done by heating gradually, moving the flame at all times. If the heat is applied too fast, the solder will melt and ball up. When done correctly the water evaporates slowly, then the silver becomes red hot and then the solder melts and flows along the joint. You cannot see the flux melt; it bubbles up first and then seems to dry out. When that takes place, watch carefully and apply the flame over both pieces until the solder melts and flows along the joint. Solder also *follows the heat*. The entire soldering operation is rather delicate but very interesting and with a little experimenting and practice you will acquire the skill of doing it correctly.

When using Handy Flux and H. & H. solder, the action is a little different. In the first place, the flux is already in paste form in a glass jar. You simply wet your brush,

get a little flux on it, and apply it. Then when the heat is applied, it bubbles up just like borax but it turns a muddy color, and gradually the bubbling subsides as the moisture evaporates. A temperature of 1100 deg. F. melts the flux. Then you know that in a few seconds the solder will melt. Watch it carefully and as soon as the solder has flowed over the entire joint, take away the heat and after a few seconds douse the soldered piece in the pickle where it will bleach out nice and white.

The method just described shows soldering in its simplest form. With practice will come assurance and as you proceed you will run into a lot of tricky soldering, but you will know how and when the solder will flow. Remember not to let the flame play on one part of the work too long. There will be times when you must apply heat to the bottom as well as the top of the work. It is soldering that makes a silversmith proficient, for no matter how well you design, file, shape, and fit the silver, if you cannot successfully solder the parts together, you are not going to get anywhere in silversmithing. If you do not succeed at once, just keep on experimenting and gradually you will learn how to solder properly. Like everything else, it is easy when you know how.

You must have plenty of heat, whether you use a blowtorch, a gas flame, or a Prestolite flame. Experiment with the flame also. It should not *blow*. An even blue flame works best, but there should be enough of it to thoroughly heat the work. Indian silversmiths use their gasoline blowtorches to solder the smallest earrings and finger rings, and also the large bracelets and bow guards. It's just knowing how, and that takes practice.

A MARK TO SHOOT AT

"Two out of every three drivers for the Railway Express Agency, New York City, will receive 'Safety Merit' cards for accident-free driving in 1946."

An estimated 17,000 of the 24,794 motor vehicle operators, including depot tractor drivers, employed by the agency will receive recognition in the form of these annual merit cards. Lapel emblems also will be awarded for 10 years of perfect driving.

The safety plan, under which these awards are made, was established 12 years ago in a concerted drive to reduce accidents. The merit cards show the number of years that drivers for the Express Agency have operated motor vehicles without an accident for which they were responsible. This year approximately 7410 drivers are being cited for perfect driving records of five to 12 years. To date, 3280 have completed 10 or more years of safe driving, the report said.

The agency, which operates 18,000 motor vehicles, considered to be the largest motor vehicle fleet under one management, lays special emphasis on its company-wide safety program in which all of the agency's 77,000 employees participate. A safety director is in charge in each of the four operating regions of the country, under the supervision of the agency's operating vice-presidents. In addition to the safety plan, the express agency includes many other phases of accident prevention in its extensive employee training program.

All activities of the program are coordinated by J. M. Shanaphy, executive representative on the president's staff at New York City.

Safe driving is a subject of national importance and schools should be in the forefront of this movement to make driving safer.

WELDED STEEL SHOP BENCH

A. G. PARKS
High School
Carlisle, Ind.

The all metal bench shown here was made in our shop. This bench is equipped with four drawers with individual locks. They are handy for storing welding and machinist tools and supplies. The bench is heavy enough to stand solidly on the floor without being fastened down. There is a heavy duty machinist vise on each end. Drawers are hung from a suspended frame beneath the top as shown. All drawers are built up of 1/16-in. steel. The top is all one piece 1/4 in. thick, 42 by 96 in. The braces for the corners are made of 5/8-in. solid rod 20 in. long, fit and welded around the corners.

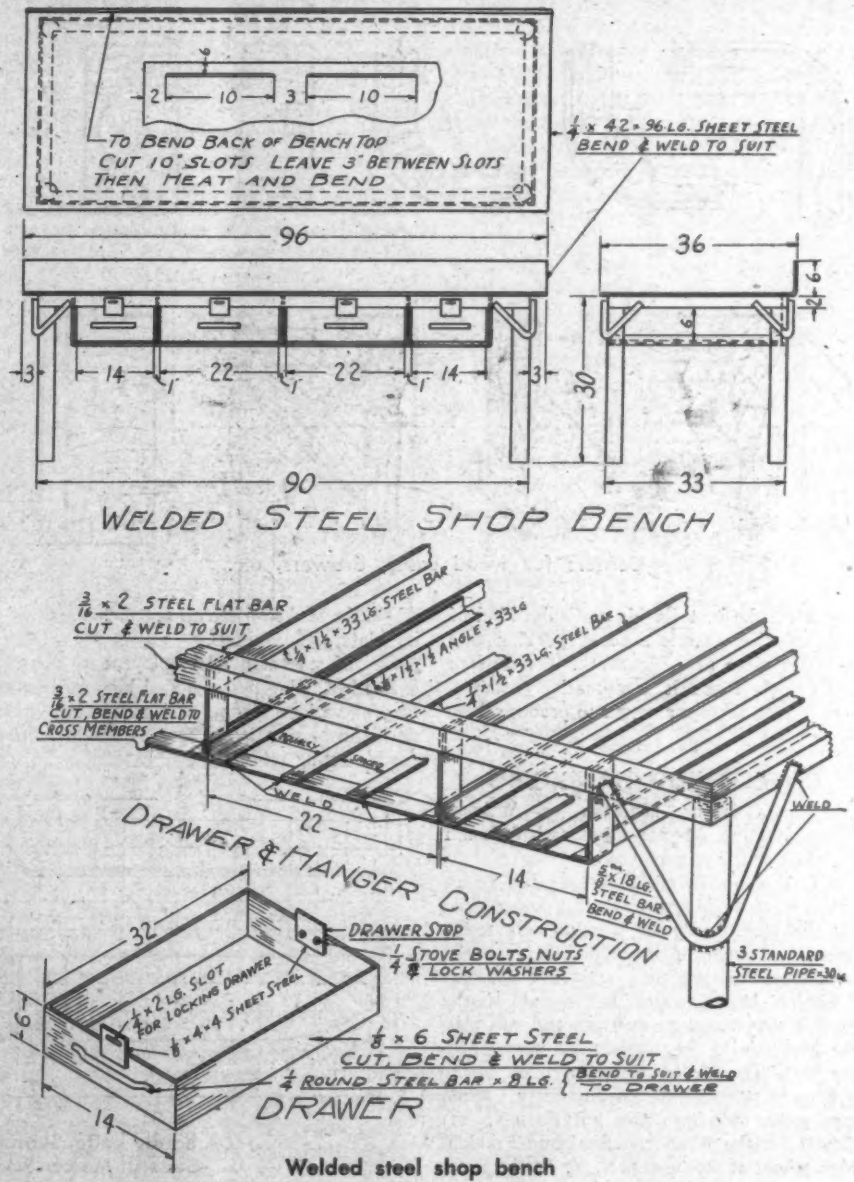
This table weighs approximately 500 lb., and costs about $16.

It is an unusually good welding project for students in the school shop.

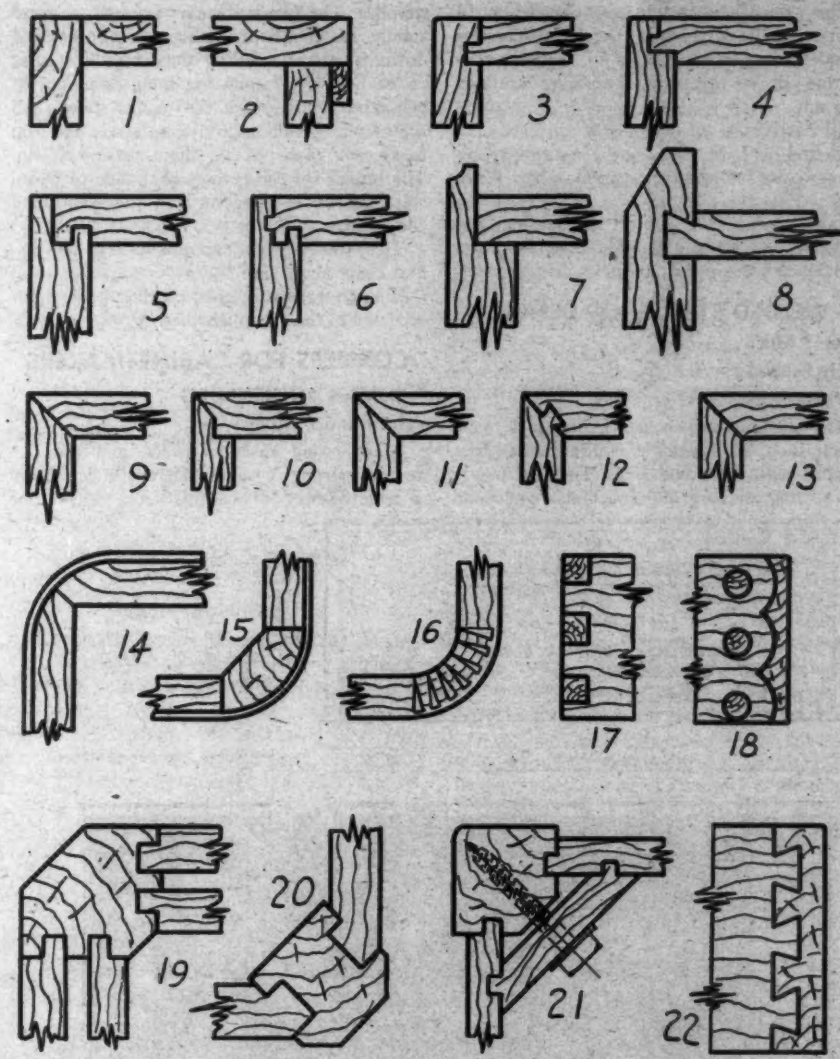
CORNERS FOR CABINETMAKERS

F. D. VAN VOLKENBURG
Kalamazoo, Mich.

Many wood cases, drawers, and the like require strong corners. Herewith is shown a wide variety of corners from which one



Welded steel shop bench



Corners for wood cases, drawers, etc.

may select the best for his particular kind of work, whether that is a rough packing case or a fine piece of cabinetwork. The modern power tools make it comparatively simple, even for the average amateur to produce these corners.

OVERCOMING HANDICAPS

Blindness is no handicap to Anthony "Tony" Cimino, 31-year-old Bausch & Lomb Optical Company employee.

A graduate of Alfred University and an instrument parts inspector at the optical firm for the past five years, Cimino was today elected president of the Balco Players, the company's dramatic club.

Cimino has appeared in several of the group's semiannual productions and will play the lead role in the forthcoming spring production, "The Yellow Shadow."

Prior to attending Alfred University, Cimino was graduated from the Batavia (N. Y.) School for the Blind and Benjamin Franklin high school at Rochester, N. Y. At the latter school, he ranked fifteenth out of his graduating class of 365 pupils.

One of several blind employees at Bausch & Lomb, Cimino has compiled his own braille file for various layouts and gauge sizes used on his inspection job as well as braille scripts for his acting roles.

Needless to say, he never suffers from stage fright and is unquestionably the calmest performer in the Bausch & Lomb cast each opening night.

A UNIT ON THE FORMULA

FRANCIS G. HUSS
Director of Vocational Education
Lansdale School District
Lansdale, Pa.

In this unit the formula is treated (*a*) as an algebraic equation, and (*b*) as it is used in lifelike situations. The unit was developed for use with tenth-grade vocational machine-shop and drawing room students. It is to follow the unit on fractional equations. The time for teaching this unit averages 4 weeks.

Objectives

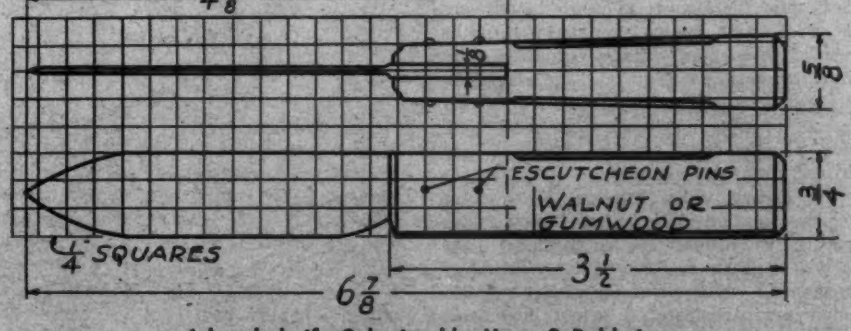
The central objective is to understand formulas and to adequately cope with situations and problems which involve formulas.

The contributory objectives are: (*a*) a general knowledge of the different kinds of formulas; (*b*) an understanding of the relationship that exists between formulas and algebraic equations; (*c*) a knowledge of the great variety of formulas; (*d*) skill in the mental manipulation of simple formulas.

The concomitant objectives are: (*a*) self-confidence, through understanding and drill in solving problems involving formulas; (*b*) an appreciation of the significance of formulas in our modern world.

Introduction of Unit

In introducing this unit to the pupil the pupil is made aware of the importance and of the need for the unit. The desirability of mastering the unit is stressed by the teacher. Then the *central* objectives are presented and discussed after which the same is done for the *contributory* objectives. The mastery of the unit is stressed together with the use to which the work of this unit will be put in the pupil's junior and senior mathematics; related science (physics), shopwork or drawing room, and in the industrial world for which he is preparing. The situations presented to the pupils must be so real that the pupil will accept them as worth while and feel an inner urge or desire to master the unit. Instances in which the sophomore student experienced difficulties in this



A handy knife. Submitted by Harry S. Baldwin, General Mercer School, Toronto, Ont., Can.

field in shop or drawing room can be presented at this time to further convince the pupil of the need for the unit.

NOTE: These instances of experienced difficulties may be obtained from the shop or drawing teacher.

Pretest

The pupil is given a number of simple problems involving formulas which are of such a nature that he can readily associate them with his shop or drawing room work. Following these problems he is given two problems of a more difficult nature as in the second example the formula must be changed and stated in terms of the desired outcome before a solution can be arrived at.

Problem 1. The formula in gear design for finding the pitch diameter of a gear when the outside diameter and the number of teeth of the gear are given, is:

$$PD = \frac{N \times OD}{N + 2} \quad \text{where:}$$

PD = pitch diameter
N = number of teeth
OD = outside diameter

Using this formula find the pitch diameter of a gear having 48 teeth and an outside diameter of 6½ in.

The pupil, in working this problem, finds that it resolves itself into a simple fractional problem.

Problem 2. Give the pupil the same formula to use in this second problem and ask him to find the number of teeth on a gear with a PD of 6 and an OD of 6.5.

The pupil will set the problem up for solution.

Step 1 — Write formula

$$PD = \frac{N \times OD}{N + 2}$$

Step 2 — Substitution

$$6 = \frac{N \times 6.5}{N + 2}$$

The pupil will realize here that this type of problem must have some further operation before simple mathematical operations give a solution.

The instructor takes over and solves first the formula read in terms of N and then solves the problem. He emphasizes again the need for mastery of the unit and if necessary presents to the class other problems of a nature similar to Problem 2.

Motivation of Pupil

The factor of motivation cannot be treated separately at any particular time. It should permeate the entire unit. The students in the usual class generally break up into two groups. One group — the more able — will accept the objectives and strive for mastery. The other group — generally the less able — have been found to respond to sympathetic help and instruction from the instructor. This is generally on an individual basis and often of a remedial nature.

S	M	1	$A = lw$	Solve for w
	M	2	$S = .5c$	Solve for c
S	P	3	$E = IR$	Solve for R
	P	4	$V = 231K$	Solve for K
	M	5	$t = .866\ r$	Solve for r
S	M	6	$A = S^2$	Solve for S
S	M	7	$A = \frac{1}{4} d^2$	Solve for d
S	M	8	$A = \frac{bh}{2}$	Solve for b
S	P	9	Efficiency = $\frac{\text{Output}}{\text{Input}}$	Solve for Input
S	M	10	$C = 2\pi r$	Solve for r
S	M	11	$A = .7854\ d^2$	Solve for d
	P	12	$H.P. = \frac{\text{Amps} \times \text{Volts}}{750}$	Solve for Volts
S	M	13	$a^2 + b^2 = c^2$	Solve for a
S	M	14	$a = \sqrt{c^2 - b^2}$	Solve for b
S	M	15	$V = LHW$	Solve for H
	M	16	$H.P. = \frac{PLAN}{33000}$	Solve for N
	P	17	$R = \frac{lA}{\Omega}$	Solve for l
	P	18	$R = \frac{lA}{\Omega}$	Solve for D
S	P	19	$1\ H.P. = \frac{3}{4}\ KW.$	Solve for 1 KW.
	P	20	$P = \frac{E^2}{R}$	Solve for E
	P	21	$s = \frac{1}{2} g t^2$	Solve for t

Problem sheet No. 1

Do not mark up this sheet. Make a separate answer sheet. Get a paper clip from the instructor. Clip your answer sheet, work sheets, to this problem sheet and hand them to the instructor, answer sheet on top and name up.

Ask for problem sheet No. 2

	P	22	Resistance = $\frac{1}{\text{Conductance}}$	Solve for Conductance
S	M	23	$V = S^3$	Solve for S
M	S	24	$P = \frac{\pi}{A}$	Solve for Pc
M	S	25	$Pc = \frac{\pi D}{N}$	Solve for N
M	S	26	$W = 0.6866\ Pc$	Solve for Pc
M	S	27	$D = 0 - 2S$	Solve for O
	P	28	$I = \frac{E}{\frac{S}{A} + r}$	Solve for r
M	S	29	$P = \frac{N+2}{OD}$	Solve for O.D.
M	S	30	$P = \frac{N+2}{OD}$	Solve for N
	P	31	$\frac{PV}{T} = \frac{P'V'}{T'}$	Solve for V'
S	M	32	$CI = \frac{0.157}{P}$	Solve for P
S	M	33	$V = \frac{4}{3} \pi r^3$	Solve for r
	P	34	$V = \sqrt{2as}$	Solve for s
	P	35	$C = \frac{5}{9}(F - 32)$	Solve for F
S	M	36	$L = 2c + 3\frac{1}{8}(R + R_1)$	Solve for R_1
S	M	37	$A = \frac{1}{2} h(b_1 + b_2)$	Solve for b_1
S	M	38	$D = 2\sqrt{\frac{a}{\pi}}$	Solve for area
S	M	39	Taper offset = $\frac{D-d}{2}$	Solve for D

Problem sheet No. 2

Do not mark up this sheet. Make a separate answer sheet. Get a paper clip from the instructor. Clip your answer sheet, work sheets, to this problem sheet and hand them to the instructor, answer sheet on top and name up.

Ask for problem sheet No. 3

Learning Exercises and Activities — Procedures

The instructor introduces the work of the unit to the class. Its relationship and continuity to the preceding work in algebraic equations is stressed by discussion, explanation, and problems.

Problem Sheet No. 1 is distributed to the class. The class together work the first five or ten problems — showing all steps necessary — individual errors and differences as well as mental doubts are cleared up. The class is then allowed to proceed with the work on the sheet.

As soon as one student finishes a sheet and hands it in, he receives the next Problem Sheet. The preceding sheet is immediately checked and marked, and if there are any mistakes, it is handed back to the pupil for *immediate* correction. The instructor must be constantly available for individual help.

Information Sheet Formulas

The formulas with which you are going to work in this unit have been taken from *Machinist Handbooks;* your junior year *Physics Books;* your sophomore, junior, and senior *Mathematics Books; Drawing Room Reference Books;* and your *Shop Theory Books.*

So that you may know from which field of work the formula with which you are working has been taken and in which kind of problem you are most likely to use it, each formula is preceded (on the left side of the paper) by a letter telling you whether the formula is most likely to be met with again in shop or drawing room, shop mathematics, or physics. In this notation, *S* indicates that the formula is likely to be found in shop or drawing room problems. *M* shows that the formula is likely to be found in mathematics problems. *F* implies that the formula is likely to be found in physics problems.

When You Are Doing This Unit

Keep *all* of your work neat and orderly on separate work sheets.

Show *all* necessary work.

Place *all* answers in answer column on *right* side of *work* sheets.

Complete *all* problems before handing in work on drill sheet.

When the students have completed the work to this stage it is time to start the mental work in formulas. This work consists of two sheets of simple formulas. The problems on each sheet are simple enough to be done mentally and involve no more than two operations.

In administering the mental drill work, the teacher should at the start insist upon having all work done mentally, the pupil using his pencil only to write the answers. The class should be given from 12 to 15 minutes for each test when first administered, the time to be reduced for each repetition of the lesson, as the pupil gains facility in performing the indicated operations mentally. Mental No. 1 is administered about five times before Mental No. 2 is used. After the pupil has become somewhat familiar with both sheets the work is alternated until such time as the majority of the class have shown themselves proficient in handling the formulas mentally. Individual cases that show difficulty in grasping the oper-

S	M	40	$D=O-2S$	Solve for S
S	M	41	$WD=\frac{2.157}{P}$	Solve for P
P		42	$Calories=1^2Rxtx0.24$	Solve for I
	P	43	$I=\frac{E}{a+\frac{n}{m}}$	Solve for n_1
	P	44	$t=\pi\sqrt{\frac{l}{g}}$	Solve for l
M	S	45	$QD=\frac{(N+2)xP_c}{\pi}$	Solve for N
	M	46	$a^2=b^2+c^2-2bc\,k$	Solve for K
S	M	47	$QD=D+\frac{P}{S}$	Solve for P
	M	48	$S=\frac{1}{2}(a+b+c)$	Solve for c
	M	49	$P=\pi\sqrt{2(a^2+b^2)}$	Solve for b
	P	50	$H.P.=A\,D^2N$	Solve for D
	M	51	$l=a+(n-1)d$	Solve for n
	M	52	$a=\frac{2S}{n}-l$	Solve for l
S	M	53	$A:B::C:D$	Solve for C
	M	54	$l=\frac{a}{n}+\frac{n-1}{2}xd$	Solve for d
S	M	55	$A=\pi(R^2-r^2)$	Solve for r
	M	56	$V=\frac{\pi ab}{6}\sqrt{R^2-\frac{a^2}{4}}$	Solve for R
S	M	57	$C=2\sqrt{h(2r-h)}$	Solve for r

Problem sheet No. 3

Do not mark up this sheet. Make a separate answer sheet. Get a paper clip from the instructor. Clip your answer sheet, work sheets, to this problem sheet and hand them to the instructor, answer sheet on top and name up.

Ask for test sheet No. 1

ations respond to after class or after school remedial treatment.

The question might be asked "How often is this work to be administered to the pupil?" The author has found that one or the other of the sheets every other day works out very well. Shorter intervals seem to bring on a lack of interest and the work loses its challenge to the pupil.

The instructor is not so much concerned with finding out how little the pupil knows at the start of this unit concerning the work to be covered as he (the instructor) is concerned with implanting in the pupil's mind a desire and a recognized need for mastery of the unit.

1	$V=S^3$	Solve for S	2	$F=\frac{9}{5}C+32$	Solve for C
3	$A=lw$	Solve for w	4	$V=\frac{4}{3}\pi r^3$	Solve for r
5	$IR=E$	Solve for R	6	$a^2=b^2+c^2-2bcm$	Solve for m
7	$P=\frac{\pi}{Ps}$	Solve for R	8	$V=ABC$	Solve for B
9	$H.P.=\frac{PLAN}{33000}$	Solve for L	10	$V=\pi r^2h$	Solve for r
11	$QD=\frac{(N+2)xP_c}{\pi}$	Solve for N	12	$D=2\sqrt{\frac{Area}{\pi}}$	Solve for area
13	$mil::x:t$	Solve for t	14	$QD=D+\frac{P}{S}$	Solve for P
15	$A=.7854\,D^2$	Solve for D	16	$l=a+(n-1)d$	Solve for a
17	$\frac{K}{m}=\frac{V}{x}$	Solve for K	18	$r=\sqrt{\frac{AV}{\pi l}}$	Solve for V
19	$a=\sqrt{c^2-b^2}$	Solve for b	20	$H=a+b-c+v-m$	Solve for v
21	$V=\frac{(2a+c)bh}{6}$	Solve for c	22	$A=\frac{bh}{2}$	Solve for h
23	$c=2\sqrt{h(2r-h)}$	Solve for r	24	$\frac{a}{d}=\frac{c}{b}$	Solve for d
25	$S=\frac{1}{2}gt^2$	Solve for t	26	$A=\pi(R^2-r^2)$	Solve for r
27	$V=\frac{\pi}{6}(D^2+d^2)$	Solve for D	28	$A=\frac{1}{2}(b_1+b_2)$	Solve for b_2
29	$S=\frac{n}{2}[2a+(n-1)d]$	Solve for a	30	$V=\frac{\pi ab}{6}\sqrt{R^2-\frac{b^2}{4}}$	Solve for S
31	$S=\sqrt{6r^2+h^2}$	Solve for r	32	$D=1.416\sqrt{A}$	Solve for A
33	$D=\frac{QD\,x\,N}{N+2}$	Solve for N	34	$c=\sqrt{a^2+b^2}$	Solve for b

Test No. 1

Place all answers on an answer sheet. Hand in all work and this test clipped together. The rating will be made on the number of correct answers.

1.	$ax=K$	2.	$by=c$	3.	$L=\frac{x}{M}$
4.	$\frac{l}{x^n}=b$	5.	$\frac{M}{V}=M$	6.	$\frac{x}{l}=l$
7.	$X^n=J^2$	8.	$JK=\frac{x}{J}$	9.	$P=\frac{V}{lan}$
10.	$M=M^2x$	11.	$\sqrt{x}=MN$	12.	$M^2=My$
13.	$V-l=Y+l$	14.	$VM^2=MY$	15.	$\sqrt{x}=\sqrt{3}$
16.	$nak=\sqrt{x}$	17.	$M=\sqrt{Y}$	18.	$\frac{y}{x}=x$
19.	$2L=x+L$	20.	$lak=kx$	21.	$x^4=B$
22.	$\sqrt[4]{x}=W$	23.	$k=x+m-n$	24.	$x^2=K$
25.	$\frac{NO.}{K}=\frac{x}{K}$	26.	$Y-l+k=0$	27.	$x-\sqrt{J}=0$
28.	$\sqrt{Y}=m-n$	29.	$K=Vx$	30.	$\frac{V}{B}=B^2$

Mental drill No. 1. Solve for x and y

1.	$W=F^3$	2.	$F=ahd$	3.	$V=S^3$
4.	$D=\frac{W}{V}$	5.	$v=\sqrt{2aS}$	6.	$EI=R$
7.	$I=\frac{E}{R}$	8.	$R=\frac{KI}{d^2}$	9.	$Wa=fg$
10.	$A=\frac{1}{2}bc$	11.	$A=.7854D^2$	12.	$Ad=l$
13.	$T=\frac{R}{2}$	14.	$P=\frac{\pi}{R}$	15.	$D=\frac{6}{10}-\frac{2}{P}$
16.	$CI=\frac{R}{20}$	17.	$QD=\frac{N+2}{P}$	18.	$t=\frac{pxD}{25}$
19.	$M=\frac{1}{8}bh^2$	20.	$\frac{a}{V}=\frac{c}{K}$	21.	$V=\sqrt{2gh}$
22.	$E=IR$	23.	$V=lwh$	24.	$C=2\pi r$
25.	$R=CAV^2$	26.	$c^2=d^2+b^2$	27.	$D=\sqrt{\frac{Area}{0.785}}$
28.	$S=4\pi R^2$	29.	$V=\frac{4}{3}\pi R^3$	30.	$S=\frac{1}{2}(a+b+c)$

Mental drill No. 2. Solve for letters indicated by arrows

S	M	58	$A=\frac{1}{2}(b+b_1)$	if $A=96, h=7, b_1=16$ — $b_1=?$
	S	59	$R=\frac{2\pi d^3}{4}S$	if $R=3220,\ d=\frac{7}{16}$ — $S=?$
	S	60	$N=\frac{H-h}{C-d}$	if $N=15, L=\frac{3}{8}, d=\frac{1}{16}, h=5$ — $H=?$
	S	61	$R=\sqrt{a^2-4ah}$	if $R=5,\ d=2.250$ — $h=?$
	P	62	$K=\frac{I-l}{(l-l')g}$	if $l=80, K=.00003, l'=50, t=25$ — $I=?$
	P	63	$\frac{1}{R}=\frac{1}{r}+\frac{1}{r'}$	if $r=6,\ R=20$ — $r'=?$
	P	64	$t:t'=\sqrt{l}:\sqrt{l'}$	if $l=10, l'=16, t=1$ — $t'=?$
	P	65	$S=\frac{1}{2}g(2t-1)$	if $S=80, g=32.16$ — $t=?$
	P	66	$\frac{C}{F-32}=\frac{5}{9}$	if $C=80$ — $F=?$
	P	67	$E=IR$	if $E=220, R=60$ — $I=?$
	P	68	$Calories=I^2Rxtx.24$	if $calories=500, R=20, t=8$ — $I=?$
	P	69	$f:w::a:g$	if $g=32.16, a=25,\ w=60$ — $f=?$
	P	70	$t=n\sqrt{\frac{l}{g}}$	if $g=32.16, l=6$ — $t=?$
3	M	71	$D=2\sqrt{\frac{Area}{\pi}}$	if $D=6$ — $area=?$
	M	72	$\frac{a}{d}=\frac{K}{b}$	if $a=6, b=3, K=10$ — $d=?$
3	M	73	$t=\frac{P+D}{2xS}$	if $t=.4, S=4000, P=250$ — $D=?$
	M	74	$V=\frac{a_1+a_2+a_3h}{6}$	if $V=60, a=10, c=12, b=7$ — $h=?$

Problem sheet No. 4

Do not mark up this sheet. Make a separate answer sheet. Get a paper clip from the instructor. Clip your answer sheet, work sheets, to this problem sheet and hand them to the instructor, answer sheet on top and name up.

Ask for problem sheet No. 5

Examination

The teacher, through observation of the classwork, and of the results of tests as well as mental work, will have a fair idea of the

	P	75	$IR=E-0.220\,S$	Solve for S
	P	76	$R_t=R_1(1+\alpha t)$	Solve for t
	M	77	$x=\frac{-b+\sqrt{b^2-4ac}}{2a}$	Solve for a
	M	78	$A=\frac{K_2}{Vh}$	Solve for h
S	M	79	if $A=\pi r^2$, show that A is also = to $.7854D^2$	$\frac{Hp\times S}{r=\frac{1}{2}}$
S	M	80	$D=\sqrt[3]{\frac{V}{\pi}}x6$	if $D=3$, $V=?$
M	S	81	$D=\frac{QD\,x\,N}{N+2}$	Solve for N
	M	82	$P=\frac{V+K}{2m}$	if $P=30, m=2, V=25, K=?$

S M 83 **RULE** — To find the area of a triangle, take one-half the base and multiply it by the altitude. Using *A* for the area, *b* for the base, and *a* for the altitude you will express the above rule as a formula.

S M 84 **RULE** — To find the hypotenuse of a right angle triangle take the square root of the sum of the altitude squared and the base squared. You will express this rule as a formula using *h* for the hypotenuse, *b* for the base, and *a* for the altitude.

S M 85 **RULE** — To find the diameter of a sphere — given the volume — multiply the volume by 6, divide the product by .., and take the cube root of the result. Using *D* for the diameter and *V* for the volume you will express this rule as a formula.

Problem sheet No. 5

Do not mark up this sheet. Make a separate answer sheet. Get a paper clip from the instructor. Clip your answer sheet, work sheets, to this problem sheet and hand them to the instructor, answer sheet on top and name up.

Ask for test sheet No. 2

mastery of the unit and the attainment of the objectives of the unit. If further work is deemed necessary some of the more difficult problems in the unit may be selected, discussed, and worked.

The unit as shown here does not express finality of this type of problem for the boy. At the completion of this unit the type of

1	$d=\sqrt[3]{\frac{12P}{n}}$	if $d=3, n=2$	$H.P.=?$
2	$V=\frac{1}{2}(b+b_1)t$	if $b=16, V=206, t=\frac{1}{2}, b_1=30$	$b=?$
3	$c=\sqrt{a^2+b^2}$	if $c=75,\ a=30,$	$b=?$
4	$P=\frac{A}{(1+r)^n}$	if $P=450,\ n=2,\ r=0.03$	$A=?$
5	$L=.470\sqrt[3]{\frac{D}{F}}MZFT$	if $L=1600; M=4, N=8, P=14, T=1.5$	$F=?$
6	$O=\frac{K}{2}-\frac{F}{t}$	if $O=110,\ F=36,\ K=24$	$t=?$
7	$V=74\sqrt{\frac{PQ^3}{W}}$		$d=?$
8	$I=\frac{E}{R+r}$		$n=?$
9	$a^2+b^2=c^2$		$b=?$
10	$V=\frac{\pi ab}{6}\sqrt{R^2-\frac{a^2}{4}}$		$S=?$
11	$a^2=b^2+c^2-2bcm$		$m=?$
12	$R=\frac{KI}{d^2}$	if $R=4, K=10.38, L=200$	$d=?$
13	$r=\sqrt[3]{\frac{3V}{4\pi}}$	if $r=3$	$V=?$
14	$t=\frac{0.472\,d}{\pi(0.029-\frac{n}{d})}$	if $n=6, d=7, t=4$	$V=?$
15	$L=\frac{KA}{V+660}$		$V=?$
16	$B=\left(\frac{5.111\,\theta}{\frac{L}{E_1}+\frac{L}{E_2}}\right)$	if $B=130, E_1=6, E_2=4$	$a=?$

Test No. 2

Place all answers on an answer sheet. Hand in all work and this test clipped together. The rating will be made on the number of correct answers.

problem presented here is incorporated into the regular testing program which has been set up to embody within its limits a constant reviewing program of all preceding course work.

REFERENCE BOOKS

Dull, Charles E., *Modern Physics* (New York City: Henry Holt and Co.), 598 pp.

Henry Ford Trade School, *Shop Theory*, The Shop Theory Department, Dearborn, Mich., 267 pp.

Oberg, Erik, and Jones, F.D., *Machinery's Handbook*: A reference book on machine design and shop practice for the mechanical engineer, draftsman, toolmaker, and machinist, 11th Ed. The Industrial Press, 148 Lafayette Street, New York, 1815 pp.

Slade, Samueal, and Margolis, Louis, *Mathematics for Technical and Vocational Schools* (New York City: John Wiley & Sons, Inc.), 517 pp.

Jones, Arthur J., "The Unit of Learning," *Educational Outlook*, Vol. IX, No. 1. School of Education, University of Pennsylvania, Philadelphia, Pa., November, 1934, 64 pp.

WHITTLING-JACKKNIFE TECHNIQUE

W. BEN. HUNT

Hales Corners, Wis.

Our Lady of Salude

Attractive statuettes, like the one shown in Figure 1, are very popular among the Spanish speaking people. Most of them are whittled and then carefully painted. Others are so ornately done that no painting is required. These latter are usually whittled out of some hard, fine-grained wood. The majority of them, however, are painted, and the nimbus often is finished in gold leaf. A glance at Figure 2 shows how the three units are fastened together with thin strips of wood. The grain on the figure and the nimbus runs up and down while the grain in the base is horizontal for added strength, so that the thin ends do not break off.

Fig. 2. Method of fastening the three parts together

Fig. 1. Our Lady of Salude

For this whittling job you will need a ⅞ by 5½ by 6-in. piece of softwood, pine, bass, or poplar, for the statuette. Also a piece of ¼-in. wood 4½ in. square for the nimbus, and a piece 1 by 1¼ by 3 in., for the base. See Figure 3 for full-size pattern.

This entire statuette was whittled with the small blade of a pocketknife. The lace cape or shawl is cut to represent folds and the edges are simply notched to represent a lacy edge. As will be noticed on the side view, the shawl sets out a bit at the lower edge.

The long cape is rounded from the front edges to the extreme outer edges, and the skirt is set back a trifle more than 1/16 in., and is perfectly flat. The kerchief is level with the lace shawl. Figure 4 shows the statuette before it was painted. Figure 3 shows how the different planes are set back.

The face is really the only difficult part. It requires patience and a very sharp knife point, and it is the only part that needs sanding. Small notches at the lower edge set off the edge of the cape.

The nimbus is cut sloping toward the outer edge to give it a graceful appearance, and it is all whittled with *V* cuts. Being a separate piece, it is easy to get at while it is being whittled. The sectional view shows how it is to be shaped. All silhouette work, of course, is done with a coping saw or a jig saw.

The base can be traced from the front view and the rest of it must be done with a knife.

Carefully fit the nimbus to the sides and mark out where the thin pieces of wood are to be set in. Then cut out, fit carefully, and glue the nimbus to the figure. The base is then attached in the same way.

After the glue has dried thoroughly, the little statue is ready to be painted. The nimbus of the one shown was merely given one coat of gold radiator enamel. Many of the statuettes are finished in gold leaf. The lace shawl is white with blue dots as shown in Figure 1. The

Fig. 3. Full-size pattern

skirt and cape are first painted with an even coat of medium blue water color, the ornamentation being done with a darker blue and a light blue. A little Chinese white mixed with a deep rich blue will give you the over-all color for the dress. The deep blue may then be used for the decorations, and then white with the addition of a little blue may be used to accentuate the decorations.

The face and hands are pinkish flesh color, lips red, hair and eyelashes black, and the little crescent marks on the symbolic hands are small half-moons. The base is brown with the lower band in gold. Two strips of ornament on the large cape are in gold also. The crown is a light greenish blue with a band of gold.

You are most likely wondering about the painting of the skirt. It looks intricate but it is really quite simple. After the over-all color has dried take a white pencil and lay out the little designs. They need not be like this one.

Fig. 4. The statuette ready for painting

In fact, no two are alike. But by using a small repeat design over the entire skirt and large cape, you will get an effect that will look as nice or perhaps nicer than the one shown in the illustrations.

As mentioned before, the figure except for the face, is left with the knife cuts showing because sanding will destroy the fine *V* cuts and take away the sharpness of the whole whittling job. But keep your finished knife cuts nice and fine and even.

TILE-TOP COFFEE TABLE

THOMAS H. ROBERTS
Iowa State College
Ames, Iowa

Explanation of the Design

The table shown in Figure 1, is essentially Swedish Modern but contains a bit of the old as well. The big problem was to blend the old and the new so that a pleasing design would be the result. Pennsylvania Dutch tile mosaic is used with the Swedish Modern table and the two are blended so that the charm of the Dutch Colonial does not seem to clash with the modern features of the lower portion of the table.

Commercial tiles may be obtained at most department stores and substituted in place of those shown in Figure 2. Other designs could, of course, be used if the tiles can be personally designed and made in the ceramics area of the school shop. Those pictured in

Fig. 1. Tile-top coffee table

Fig. 2. Pennsylvania Dutch tiles

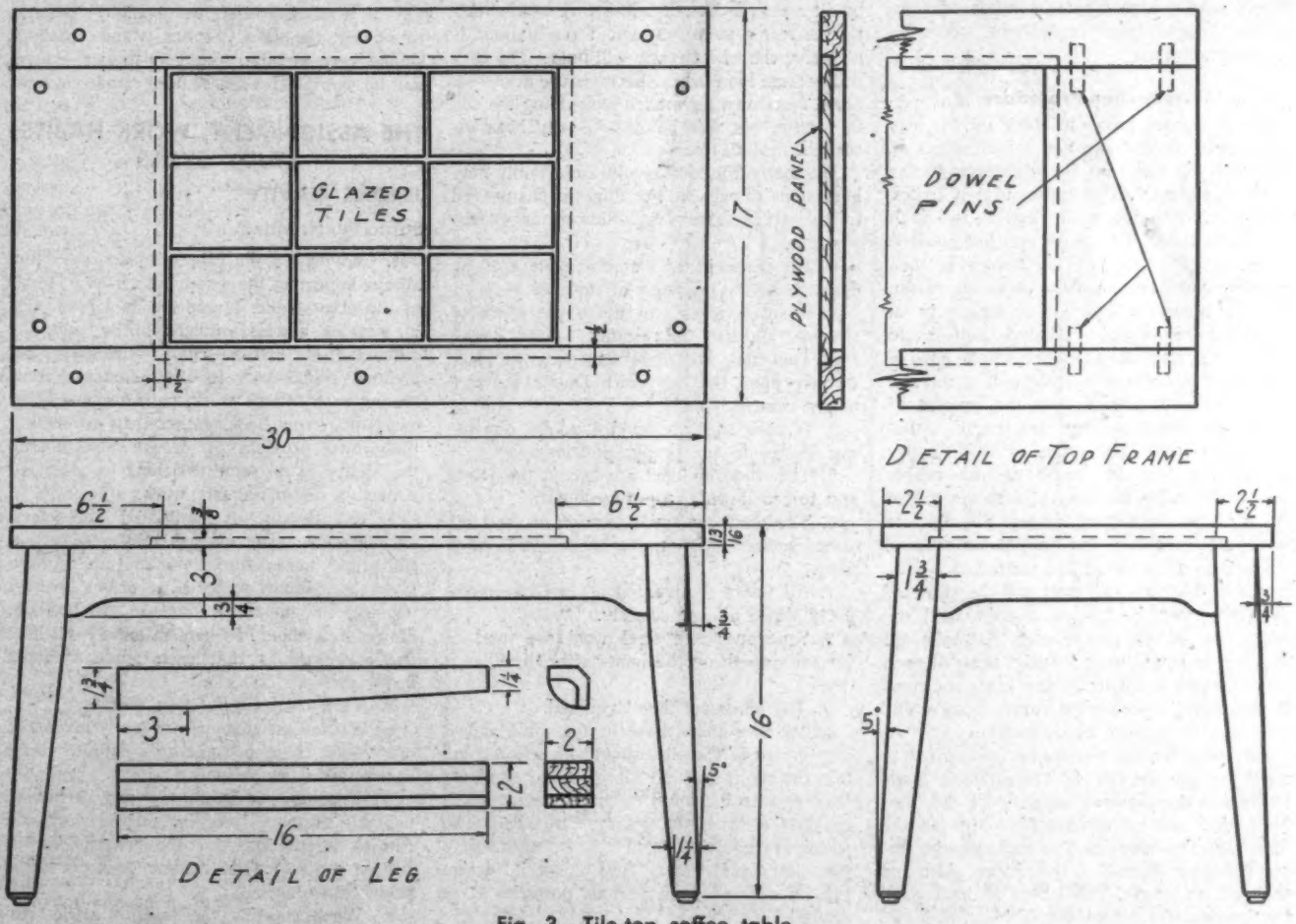


Fig. 3. Tile-top coffee table

Figure 2 were designed and made in the pottery shop of Valley Forge General Hospital, Phoenixville, Pa.

BILL OF MATERIAL

No. of pcs.	*Name of part*	*Size*
10	Legs	13/16 x 2 x 17 in.
2	Side rails	13/16 x 3 x 26 in.
2	End rails	13/16 x 3 x 13 in.
2	Top side rails	13/16 x 2½ x 31 in.
2	Top end rails	13/16 x 6½ x 13 in.
1	Fir plywood top panel	⅛ x 14 x 17 in.
4	Tile dividers	¼ x 5/16 x 17 in.
4	Tile dividers	¼ x 5/16 x 13 in.
8	Birch dowel pins	⅜ x 2 in.
9	Glazed tiles	3⅜ x 5 5/16 in.
4	Hanger bolts	¼ x 3 in.
4	Table leg corner braces	1½ x 3 in.
8	R.H. blued wood screws	No. 8 x 1¼
10	F.H. wood screws	No. 6 x ¾
1	Crack filler	1-lb. can

The choice of wood should be in keeping with the tile color and design. In the table pictured in Figure 1, yellow birch (Betula Lutea) was chosen. The natural color of the wood lends itself to the colors in the tile and also works well for Swedish Modern design.

Hardware can be obtained from any well-known supply house. Various kinds of tiles may be bought from department stores or tile manufacturers.

Construction Procedure

Two of the ten pieces of stock for the legs are resawed so that two and a half pieces of stock can be glued up to form each leg as shown in Figure 3. Two pieces of 1-in. stock may be used to make the legs if full inch stock is available. The pieces are then squared up to 1¾ by 1¾ in. One corner is then rounded to the proper shape as shown in the detail in Figure 3. Tapering is done only on the two inside edges of the legs, and should start 3 in. from the top. The inside edge is chamfered in order to further reduce the size of the leg and to carry out the concept of the design. Since the legs are spread 5 deg. both ways from the vertical it is necessary to cut the legs to length at the proper angle. Pilot holes for hanger bolts are drilled 1½ in. from the top of the leg. The legs are then sandpapered to the desired smoothness.

The rails are selected and jointed to 2¾ in. in width. The two end rails and the two side rails may then be *tacked together* and the design cut on the lower edge. All rails are then cut to length with a 5-deg. angle at each end as shown in Figure 3. Saw kerfs are made in the rails to receive the corner braces. The rails can be sanded as desired.

Side rails for the top frame are jointed to width but are not cut off. The rabbet is made to receive the plywood support for the tiles. Note that the rabbet extends only for the length of the opening. The end rails for the top frame are jointed to the proper width and then cut to length. The length is determined by the size of the tiles and dividers, and care should be taken to insure the squareness of both ends. Rabbets are cut on the bottom inside corner to receive the plywood support. This rabbet should match the one cut on the side rails of the top frame. Holes are then laid off and drilled for the 2-in. birch dowels that hold the frame together as shown in the detail in Figure 3. The frame is then glued up and clamped so that the top is not warped. Since the side rails of the top frame were not cut to length, there will be short lugs at each end to cut off. Sanding should be done with the grain and the outside corners of the top rounded slightly with sandpaper.

Shaping the legs might be made easier by some suggestions. A fixture can be made by nailing V-shaped blocks on a 1 by 2. This fixture can then be clamped in the bench vise and the leg held in place for rounding the outside corner. The legs can be tapered by the use of the block plane or by using a stopblock on the jointer. Angles on the legs and rails may be cut on the band saw by making use of the tilting table and adjustable fence.

Setting the Tiles

Students and teachers have at times encountered considerable difficulty in setting the tiles in wood tables. Most of the trouble has arisen in the materials and methods used in anchoring the tiles to a base. Excessive moisture should by all means be avoided. Moisture is absorbed by the frame members, and if the amount is excessive the whole frame will bulge. The tiles will become loose when this moisture dries out. Some craftsmen have tried embedding the tile in mastic, but this has not usually been altogether satisfactory.

The method used to avoid these faults may have some drawbacks but thus far has proved to be satisfactory. The following procedure was used.

1. The recess in the frame is made 1/16 in. deeper than the thickness of the tiles.
2. Wood dividers are cut to the width of the joint and half the thickness of the tiles.
3. The tiles are then cemented in place directly upon the base with Dupont's transparent cement.
4. Warped tiles are leveled up by cementing wedges in the proper positions.
5. The wood dividers are laid in the joints and forced down to the base board.
6. The small remaining portion of the open joint is filled with putty made with crack filler.
7. All joints are pointed up and the excess putty wiped off immediately.
8. Sandpaper and steel wool are used to further smooth up the joints after the filler is dry.
9. The joints are then lacquered.

Other tiles than those in the table shown may be used. The tiles should be selected before the top is started. Tile sizes vary and for that reason it would become necessary to change the size of the top frame members. The width of the joint could also be changed to meet individual tastes. Tiles of special design can be ordered from various potteries if so desired.

Finishing

No project is ever any better than its finish. Many good shop projects turn out to be complete failures because not enough study and effort were used in preparing the surface. The parts of this table were sanded with No. 1 grit sandpaper, followed by No. ½ grit, and then with No. 2/0 grit. After the final assembly No. 2/0 grit sandpaper was again used. The table was then thoroughly dusted and the following finishing procedure used.

1. Apply a coat of 4-lb. white shellac.
2. Sand with No. 3/0 abrasive paper.
3. Apply a second coat of 4-lb. white shellac.
4. Sandpaper with No. 3/0.
5. Apply a coat of clear varnish. (Clear lacquer may be substituted for varnish.)
6. Hand rub with pumice stone and paraffin oil.
7. Wax.

Summary

This table has proved popular as a shop project in high school. The construction is not beyond the ability of the high school boy using either hand tools or power tools. General shops with a ceramics area might find it especially suitable for advanced boys. A number of modifications can be made both in the kind and design of the tiles and also in the kind and finish of the wood. A solid wood top or a glass-covered top could be substituted for the tiles. Students and teachers should keep in mind that good design should not be sacrificed when making modifications.

THE ASSIGNMENT, WORK HABITS, STUDY SKILLS

JEROME LEAVITT

Santa Fe, N. Mex.

1. Copying, in the shop subjects, does not always appear in the same manner as in some of the other fields. It appears as a poor way of working and is indulged in by lazy, indifferent, or self-conscious students. The greatest problem is to keep students from tracing each other's work, patterns, or taking everything from books rather than developing their own projects or designs. Developing the ability to do some designing is, after all, a part of industrial-arts work.

2. To provide for individual differences, each student, after he has mastered certain skills and knows the shop routine, can be given individual projects according to his physical and mental ability and his interests. However, it should be kept in mind that these are many things that each student should know and participate in.

3. *Work Habits and Study Skills*

a) Written assignments are rarely given and only when there is something definite to be accomplished by them.

b) Reading assignments provide very valuable means of teaching related work and furnish instructions for the construction of certain projects. Oral reading does not often prove advantageous.

c) When entering the seventh grade, stu-

dents should have had creative experiences in working in various industrial media such as wood, metal, cardboard, clay, paper, cloth, leather, plastics, and the like. Simple practical instructions should have been given in these areas on the grade level that the work was accomplished in. This means that all students should have had many experiences with materials and tools during their elementary school years.

d) Students in the ninth grade should be able to work quickly and efficiently as well as think through mechanical and shop problems. They should have acquired a background of related technical and scientific information and have acquired various service skills.

4. Frequent checking on long units must be done every week or at the end of other stated intervals to keep the students alert and, at the same time, prove that the teacher thinks enough of the work to follow through on it.

5. The amount of assignment will depend upon the level of work and on the subject itself. No definite scale can be made.

WELDING TERMS

GEORGE E. FLYNN

Trade School

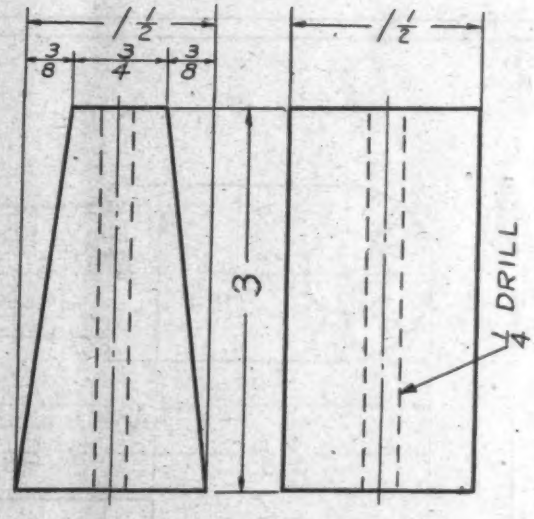
Chicopee, Mass.

abrasive
abrasion
acagine
accessories
acetone
acetylene
acid
adaptable
adapter
adhering flux
adhesion
agitator
air-acetylene
alcumite
alloy
aluminum
alpha brass
alternating current
aluminothermic process
amalgamation
Ambrac
ambraloy
ammeter
amperage
amperages
ampere
Amsco
Anaconda
Anaconda economy bronze
analyses
annealing
annoyances
anode
anode drop
apparatus
approximately
arc
arc blow
Arcometer
arc stream
arc-stream voltage
arc voltage
arc welding
arc-welding machine
armatures
armatures shaft
asbestos
asbestos paper
atom
automatic butt weld
automatic spot weld
automatic weld
axles
backing
Bakelite
band
band saw
bare-wire electrode
bar magnet
base metals
battery
bead
bead forming
beading weld
bearing
bending test
beta brass
beveling
billet nicking
bits
blades
Blaugas
blow hole
blowoff valve
blow pipe
Blukote
bolection
brackets
braided
branches
brazing
brazing metal
brazing wire
bronze
brushing
bucket lips
buckeye
buckled
buckling
bull plug
Bunsen burner
burning
burr
butt miter
butt joint
butt weld
cable
cadmium
calite
calking
carbohydrogen
carbon
carbon-cross point
carbon dioxide
carbon electrode
carbon header
carbon monoxide
carbon tetrachloride
carburizing flame
castings
cast iron
cell
cementite
centigrave
centrifugal
channels
chill bar
chipping
chrome
chromium
cinder bed
clamps
closed joint
coated
coated electrode
code
coefficient
cohesion
cold shortness
cold shuts
collar
combustible
combustion
commercial flux
compact
composite electrode
composite joint
composite structure
composite weld
concave
concave weld
concentric

(Continued on page 180)

Job 21. Draw a right end view of the square tapered plug.

Purpose: To teach the reading of a right end view.



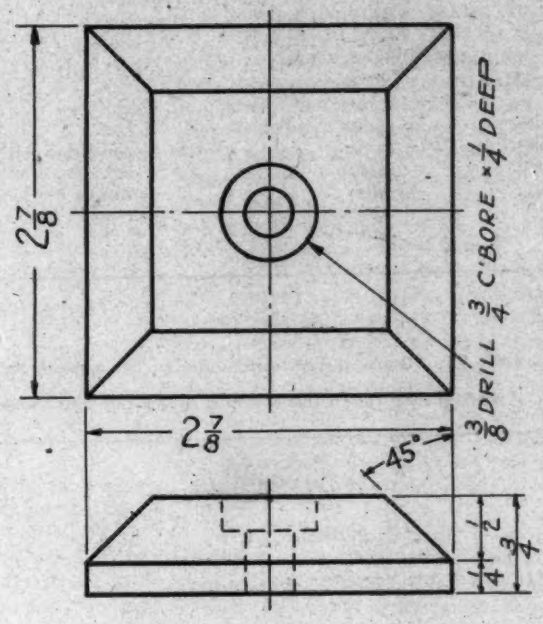
Square tapered plug

1 req'd. M.St.

Your Name Date Completed

Fundamentals of blueprint reading. C. H. Niemann, Oliver Morton High School, Hammond, Ind.

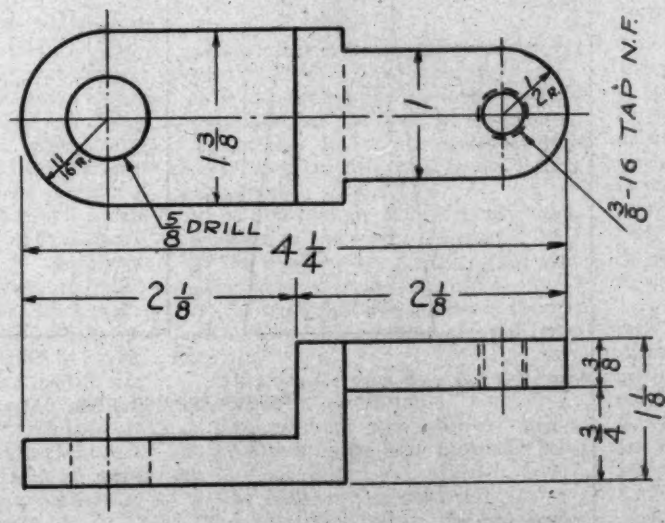
Job 23. Draw a right end view of the die block.
Purpose: To teach the reading of a right end view.



Die block
1 req'd. T.St.

Your Name | Date Completed

Job 22. Draw a right end view of the clamping bar.
Purpose: To teach the reading of a right end view.

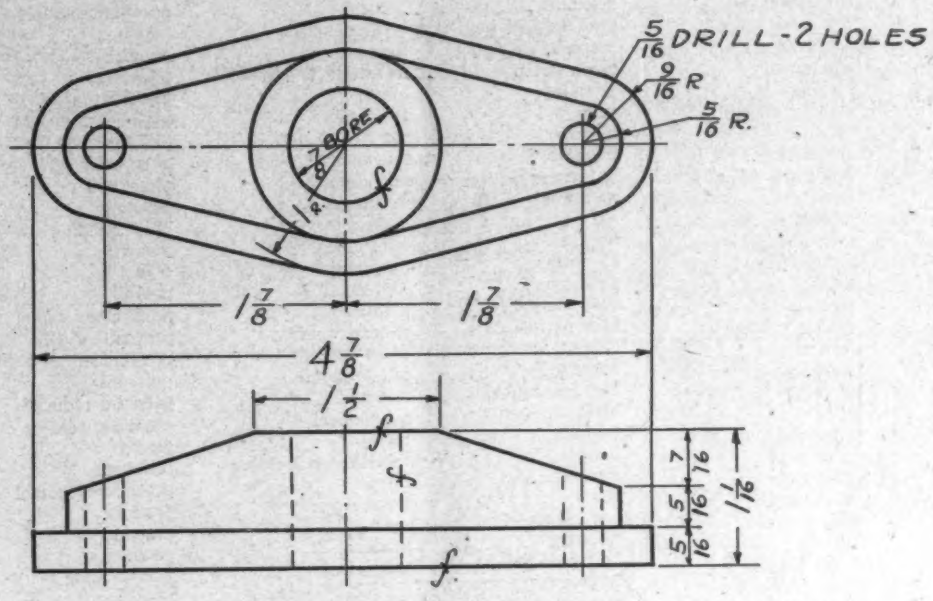


Clamping bar
2 req'd. M.St.

Your Name | Date Completed

Fundamentals of blueprint reading. C. H. Niemann, Oliver Morton High School, Hammond, Ind.

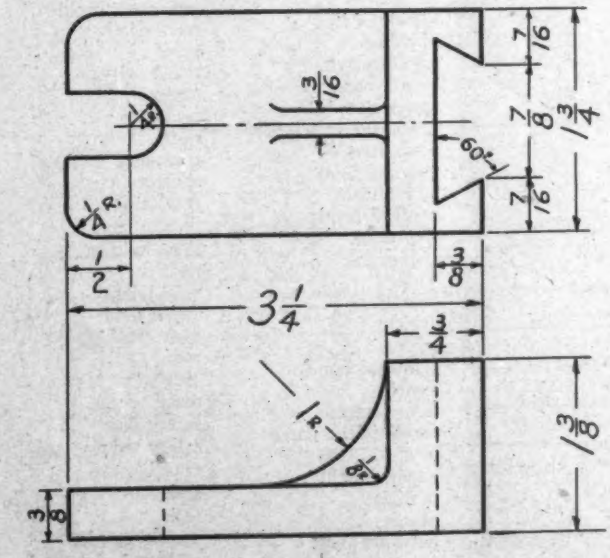
Job 25. Draw a right end view of the swivel base.
Purpose: To teach the reading of a right end view.



Swivel base
1 req'd. C.I.

Your Name Date Completed

Job 24. Draw a right end view of the clamping plate.
Purpose: To teach the reading of a right end view.



Clamping plate
1 req'd. M.I.

Your Name Date Completed

Fundamentals of blueprint reading. C. H. Niemann, Oliver Morton High School, Hammond, Ind.

(Continued from page 177)

concrete
condor
conductance
conductivity
cone
conical seat
considerable
consumption
contact bar
contact jar
contact point
contact process
contact roller
content
continuity
continuous weld
contraction
convex face fillet
copper
copper sulphate
core box
corner joint
corrugated
corrugated patch
couplers
covered electro
covered glass
crankcases
crankshaft
craters
creeping
critical temperature
crosses
cross welding
cylinders
damage
density
deoxidized
deoxidizing agent
dependable
deposits
deposited metal
deseaming
detrimental
diameter
diamond substitutes
diaphragm
dies
dip drying
direct current
dished patch
disassociation
distortion
drift
drills
driving wheels
drop forged
drop-horn
drying
dry sand
ductile
ductility
duplex welding
eccentric
edge joint
edge weld
elastic limit
electric
electric annealing
electric rivet
electric Siamese
electric tempering
electric units
electric welding
electrode
electrode holder
electrolytic
electronic tornado
electrostatic weld
eliminate
elongation
equiaxed
equiaxed grain
equipment
etching
etching reagent
eutectic
expansion
expansion joint
extensive
fabricated
face fillet
Fahrenheit
feather
feeding disk
fender welding
ferrite
ferrous
ferrule
fiber
filler rod
fillet
fillet rod
fillet welds
filling metal
filter
filtration
finished weld
firebrick
fixed joint
flame characteristics
flame hardening
flame machining
flame propagation
flame turning
flange
flange nut
flange pipe
flashback
flashback arrester
flash-weld
flexible
flour
flow indicator
flues
fluid
flush
flush weld
flux
forehand welding
forged
forge welding
foundry
fracture
framos
frangible disk
freezing
frog points
fuming
furnished
fuse
fusibility gauge
fusible plug
fusing
fusing weld
fusion
fusion zone
galena
galvanize
gas
gasometer
gas pocket
gate
gear teeth
generator
glycerine
goggles
grain
graphite
graphite arc weld
graphite electro
green drum
grooving
guide
hammer
hangers
hardening
hardness
hard setting
hazards
H beams
head gear
heat conductivity
heat of fusion
helmet
hogging
homogeneous
hood
hopane
hopper
horizontal
horn
hot short
hubbing
hydrated lime
hydrogen
impact bending test
implements
impurities
incandescent
index die
indispensable
induction
ingot
inlet manifold
installation
insulate
intermittent
internal strains
ignization
iridium
iron
jet
joints
butt
corner
edge
plug
lap
strap
bell
mitered
spigot
kerf
kilowatt
kilowatt hour
kip
lap joint
lapped
lap-seam welding
lap weld
laterals
lathe chuck welding
law
layer
layout
lead
length of weld
lenses
lens holder
lighters
lime
line welding
liquefaction
liquid
liquid-air process
litharge
located
long arc
longitudinal seam
loom
low spots
lug
machinable
macrograph
magnetic
malleability
malleable
manganese
Manganal
manifold
manual welding
mash welding
Mastermetal
materials
mechanical
metal
metallic air welding
mica
micrograph
mild
mildew
minimize
mixing chamber
mold
molten
molybdenum
monel
monolithic
motor heads
mold welding
mud rings
multijet tip
multilayer
Nicastox
nichrome
nickel
nipple
Nitralloy
nitride of iron
nitriding
noncorrosive
nonferrous
noninsulated
nonmagnetic
nonporous
nonrigid joint
normalizing
notched bends
obnoxious
operations
outlet
overlap
oxidation
oxide
oxidizing flame
oxweld
oxyacetylene
oxyacetylene flame
oxygen
padding weld
particles
paste
patching sheet
pattern
pea
pearlite
peel
peening
penetration
percentage
percussive welding
phospher bronze
phosphorus
photomicrograph
pickle
pinch bar
piping
plasticity
plate
platinite
plug weld
plum bob
pointing
point welding
polarity
pole
pool
prefluxing
preheat
preignition
pressure
pressure reducer
pressure welding
priced
problems
procedure control
produce
propane
protection
puddle stick
puddling
purging
purifier
radiation
radius rod
reactance
reactor
recession
reducers
reduction
refined zone
regulations
regulator
regulator screw
reinforced
reinforced weld
relatively
relief
relief valves
repair
resilience
resin
resistance welding
resistor
respirator
ribbon flame
ridge-welding
rigidity
rigid joint
ripple weld
rock crushing
rod
root
rosin
safety disk
safety valves
sand blast
scab
scale
scaling powder
scalloped edge patch
scarfing
scolerscope
screen
seamless
seam welding
segments
self-fluxing
semiautomatic weld
semisteel
shafts
shape welding
shears
sheaths
sheets
sheet trimmings
silicon
silicon-aluminum
silfram
silver solders
simplex
slag
slag-covered electrode
slip
sludge
soft solder
solder
soldering
spark
specifically
spelter
spot weld
stainless steel
standard
station
steels
stellite
stop-back welding
stick weld
stirrup
straightedge
strainer
strap weld
strength weld
stress
striking
structural
structure
studding
stuffing box
sulphur
superheater
superior
supplies
switch contacts
symbol
tack joint
tangent
tapered
technique
temperature
template
templets
tensile
tension
terminal connection
tin
tinning
tipping
tips
titanium
tobin
tolerance
torch
torch head
tougher
truck bolsters
tube welding
tubing
tubular
tumble
tungsten
tungsten carbide

tunking fit
ultraviolet ray
unaffected zone
unbalanced flame
undercut
units
upset weld
valve bodies
  gates
  seats
  stems
  packing
vanadium
V block
V joints
velocity
vent
ventilation
vertical welding
viscosity
visibility
visual
voltage
Voltex welding process
vulcanized
warping
washing
wash welding
water jackets
water mixture
water outlet
water seal
watt
weaving
wedges
weld
welding
white metal
wire cloth
wringing fit
wrought iron
wye
zinc
zinc oxide
zinc sulphate

A FABRICATED C CLAMP

HAROLD A. OAKES

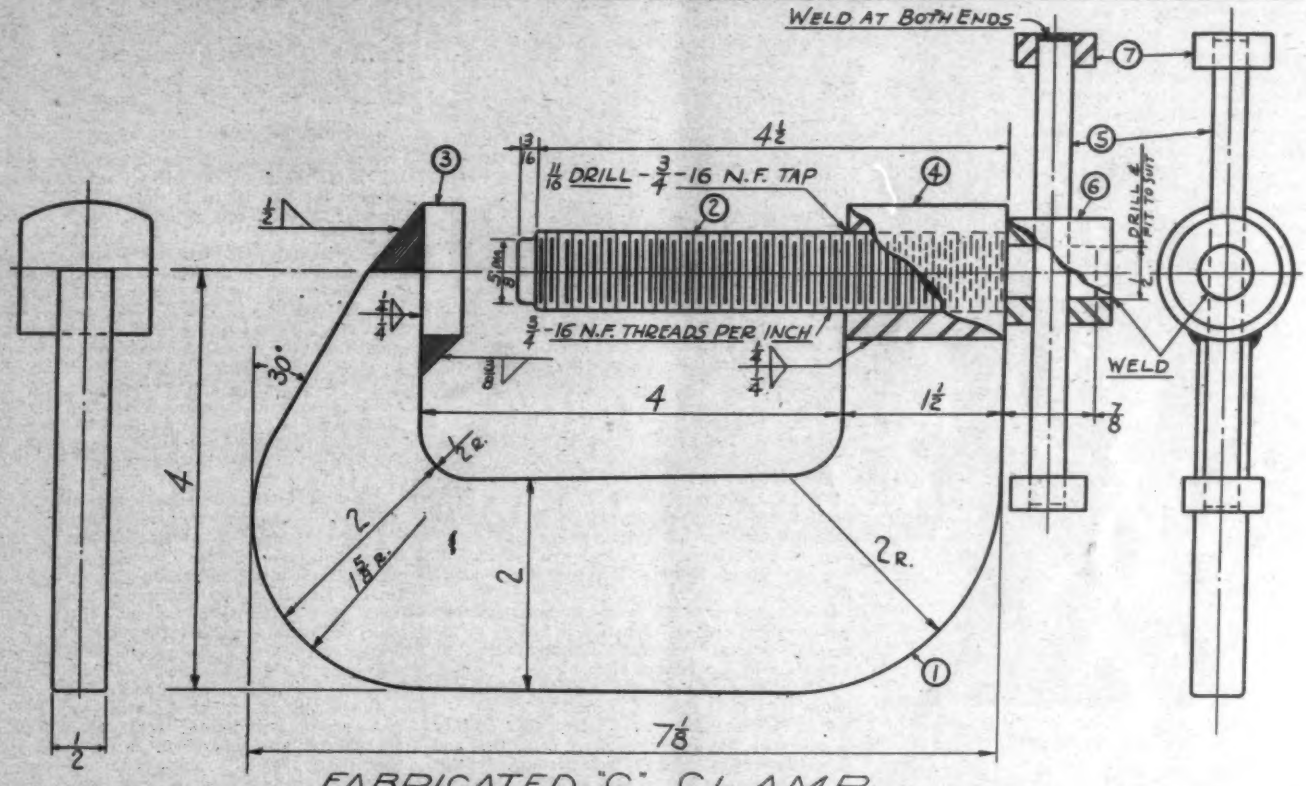
Portland, Ore.

Each term in the machine shop at Benson Polytechnic School we were forced to discard quite an assortment of *C* clamps that the boys had found some way to put out of commission. Usually they had either bent screws, sprung frames, or there was a failure in a weak spot.

For the past several years we have been making our own, and find that beside a considerable saving, they provide valuable training in the use of simple machine tools, hand tools, and welding equipment. Furthermore, since nearly every boy has had a hand in making some part of the clamps, they have more meaning to him and the clamps are treated better than a similar *store bought* article.

Usually we divide the job so that beginning machine students supply the sliding handle, a knob, and pad; advanced lathe students supply the nut and screw; and the welding class furnishes the flame-cut frame, and does the assembling.

Of course, the frames may be of various sizes for different jobs, but the screw need not be any longer. We prefer the short stiff screw as sketched. It does not get bent.



FABRICATED "C" CLAMP

BILL OF MATERIAL

ITEM NO.	NO. REQ'D.	DESCRIPTION	REMARKS
1	1	½ × 4 × 7⅛ LG. MILD STEEL	GRIND OFF ALL SHARP EDGES
2	1	1 DIA. × 6 LG. MILD STEEL	TURN TO ¾ DIA. & THREAD
3	1	⅜ × 1¼ × 1¼ LG. MILD STEEL	WELD TO ITEM 1
4	1	1¼ DIA. × 1½ LG. MILD STEEL	WELD TO ITEM 1
5	1	5/16 DIA. × 4½ LG. MILD STEEL	WELD TO ITEM 7
6	1	1 DIA. × 1 LG. MILD STEEL	DRILL & FIT TO SUIT ITEM 5
7	2	¾ DIA. × 5/16 LG. MILD STEEL	DRILL & FIT TO ITEM 5 & WELD ENDS

Fabricated C Clamp

The other feature that should not be changed is the handle. Most commercial handles do not give enough hand leverage, and a wrench is used by the student with disastrous results.

To secure proper alignment when welding, we find it advantageous to slip a close fitting rod through the nut, when tack-welding, to see if it is aimed directly for the other end of the frame. The pad is welded in position last and positioned by clamping a square block in the clamp.

Personal News

RESEARCH DIRECTOR DR. CARLTON E. WRIGHT

The American Vocational Association has appointed Dr. Carlton E. Wright as director of research and publications.

Dr. Wright's appointment was made on the joint recommendation of the American Vocational Association Executive Committee and the Committee on Research and Publications. He will work as an assistant to Executive Secretary L. H. Dennis, having as his major responsibility the development of the functions of research and publications of the American Vocational Association. He began his work in the Washington office on February 1, 1947.

Dr. Carlton E. Wright

Prior to coming to the American Vocational Association, Dr. Wright was director of the New York State Institute of Agriculture and Home Economics at Cobleskill, N. Y. A native of Vermont, and a graduate of the University of Vermont, College of Agriculture, he took his master's and Ph.D. degrees at Cornell University. He has worked as a teacher, a teacher-trainer, and as an administrator in the field of vocational education with experience in Vermont, New Hampshire, and New York.

♦ JOSEPH A. SCHAD, formerly director of vocational and adult education, Newport News, Va., has been appointed associate professor of industrial arts education at Virginia Polytechnic Institute, Blacksburg, Va. In his new capacity Mr. Schad has the responsibility of organizing and developing the state's new industrial-arts teacher education program. The inauguration of the new field of work marks Virginia's first effort to prepare white teachers for the growing field of industrial arts.

Mr. Schad is the immediate past president of the Virginia Vocational Association, member of the Virginia Vocational Association Executive Board, past president of the Peninsula Industrial Education Club of Virginia, member of the Newport News Boys Club Board of Directors, and past president and vice-president of the Newport News Exchange Club. He holds memberships in Epsilon Pi Tau, Delta Kappa, and Phi Delta Kappa fraternities.

Mr. Schad's undergraduate work was done at State Teachers College, Oswego, N. Y., and his graduate work at Cornell University. He has also taken work at the College of William and Mary.

Articles of a professional nature have appeared under his authorship in the INDUSTRIAL ARTS AND VOCATIONAL EDUCATION magazine.

♦ FRANK GOURDOUZE is teaching industrial arts and coaching at Worthington, Ind. Following his graduation from Indiana State in 1942 he spent three years in the navy teaching radar and coaching athletic teams. He succeeded Robert Wampler at Worthington.

♦ R. L. GRUBER, director of the Cudahy School of Vocational and Adult Education, Cudahy, Wis., resigned from this position on October 1, 1946. He is continuing as a member of the faculty at the Cudahy School, however, in charge of the in-plant training program.

He has been with the Cudahy School of Vocational and Adult Education for 26 years.

♦ WILDON F. OWENS, formerly co-ordinator at the Kenosha School of Vocational and Adult Education, Kenosha, Wis., has been appointed director of the Cudahy School of Vocational and Adult Education, Cudahy, Wis.

Mr. Owens also taught in the vocational school at Ashland, Wis.

♦ HUGH L. OAKLEY, former director of industrial arts and vocational education in Lexington, Ky., has been appointed head of the new department of industrial education at Murray State Teachers College, Murray, Ky.

♦ DWIGHT C. BAIRD was made director of placement, University of Denver. He was formerly state supervisor of occupational information and guidance for Colorado.

♦ JOHN HUGHES has resigned as state supervisor of occupational information and guidance for Maine to become guidance consultant with the California Test Bureau.

♦ W. C. BICKNELL, formerly director of mechanical arts for veterans at the University of Missouri, has been appointed professor and chairman of the department of industrial education, Southern Illinois Normal University, Carbondale, Ill.

♦ JOHN L. FEIRER has been appointed assistant director of vocational education in charge of industrial arts, at Western Michigan College of Education in Kalamazoo, Mich.

♦ PAUL KOMATZ has been appointed director of industrial arts at Parsons, Kans.

♦ L. B. PERRY has retired after half a century in education. He began his career in Indiana and upon retirement was an industrial-arts teacher in the Rochester, Ind., school system.

♦ W. CARL WILSON, senior rehabilitation counselor in the Raleigh district office of the division of vocational rehabilitation, has been made head of the department of research and statistics in the North Carolina state office.

♦ HAROLD B. TAYLOR has succeeded Harry F. Ainsworth as state supervisor of vocational agriculture in Indiana. He had been associate state supervisor since last September.

♦ CARLOS A. RODRIGUEZ, former local director of the Guayama Vocational School, Puerto Rico, has been appointed local director of the Dr. J. Gomez Brioso Vocational School in Santurce, P. R.

♦ FRED W. ERHARD, assistant director of Apprentice-Training Service, U. S. Department of Labor, has been awarded the Legion of Merit Citation, for "exceptional meritorious service from September, 1944, to April, 1946, as Chief, Civilian Technical Training, and Chief, Civilian Training Branch, Office Chief of Ordnance."

♦ ARTHUR A. ELDER, director of the Workers' Education Service at the University of Michigan, has been appointed director of the Labor Department's Labor Education Service.

♦ J. C. WOODIN, director of vocational and adult education, Wichita, Kans., was recently appointed to be one of a group of one hundred vocational educators to meet in Chicago on May 8, 9, and 10. This conference will make a study of "Vocational Education in the Years Ahead."

♦ RALPH P. HARBISON is teaching industrial arts at Greencastle, Ind. He attended Purdue University one year and was graduated from Indiana State in 1941. He taught two years at Mattoon, Ill., and one year at Harrison, Ohio. Mr. Harbison spent two years as lt. (jg) in the navy, where he had charge of repair work on his ship. He is teaching drawing, shop math, woodwork, and general shop at Greencastle.

♦ EMORY DIXON is teaching industrial arts at New Albany, Ind. Following his graduation from Indiana State in 1943, he spent almost three years in the army. He has also started work on his master's degree.

Association News

AMERICAN INDUSTRIAL ARTS ASSOCIATION

"New Developments in Industrial Arts Education" is the theme for the AIAA Convention this spring at the Neil House in Columbus, Ohio, on Thursday, Friday, and Saturday, April 24, 25, and 26, 1947.

The Ohio Industrial Arts Association, which is also a department of the Ohio Education Association, besides being an AIAA affiliate, will be host this year and the presidents of the two associations will serve as co-chairmen. Two important sets of exhibits, commercial and county school, are to be shown. The first of these is being arranged by the AIAA and will be found on the mezzanine floor of the headquarters hotel, while the second is being arranged by the OIAA and the Ohio State Department of Education and will be found in the hearing room two of the new state office building near by.

The three sessions planned for Thursday, April 24, are for members in positions of leadership or who are planning to hold such positions. The first session will be a luncheon devoted to the so important postwar problem of Industrial Arts Teacher Education. Qualified leaders from various parts of the United States will discuss three topics: "Trends and New Developments at the Baccaulaureate level," "Trends and New Developments at the Master's level," and "Professional Accomplishments in Research and the Doctorate."

The second session on Thursday will be the first program ever devoted to the whole question of industrial-arts supervision at the state level. Nine states operate currently with full-time officials and several others are arranging budgetary provisions for their appointment, so this program will be more than timely. It will present such topics as: "Elements of a State Program," "Standard Items of Information or Statistical Data to Be Collected and Supplied by the State Supervisor," "The Workshop of Inservice Program," "Inspectional Survey, and Advisory Functions," "Professional Relations and Co-ordination," and "A Review of What Has Been Accomplished During My First Year," by the new Ohio supervisor.

The third session is a Planning Conference of Association Leaders where the presidents, or their representatives, of the 37 affiliated regional, state, district, and local associations of the AIAA will assemble to consider: policies and plans, programs and publications, reports and resolutions, and conclude by examining the statements about industrial arts which the association plans to publish in co-operation with the National Education Association concerning the American program. This important publication is planned for wide and free distribution among school administrators and teachers.

(Continued on page 14A)

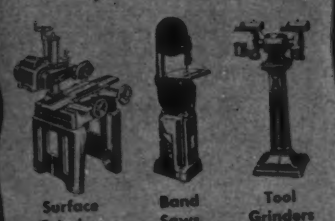
The woodworking shop of State Teachers College, Fitchburg, Mass., is one of many Delta-equipped shops in schools throughout the nation.

Your shop-equipment budget provides for more machine tools...

DELTA
MACHINE TOOLS

ROCKWELL DELTA MILWAUKEE

Sanders Drill Presses Shapers



Surface Grinders Band Saws Tool Grinders

By specifying low-cost Delta* Machine Tools, you can request a greater number of units

The savings your school board makes on Delta Machine Tools cut down the investment necessary to completely equip your shop.

The low cost of Delta tools results from applying modern production methods to a large volume of standard models — there is no compromise with quality.

With more Delta Machine Tools on the classroom floor, you can give a *greater number* of students *more hours* of actual machine instruction. You are able to better equip pupils to take their places in industry; Delta tools are used by practically every branch of industry.

Free! *Catalog B-15 illustrates and describes low-cost Delta Machine Tools that meet these requirements: economy of purchase and operation... ideal size and weight . . . high standards of safety. To request your free copy, use coupon at right.*

*Trade Mark Reg. U. S. Pat. Off.

Delta Machine Tools offer other advantages, also: (a) They are compact and portable, permitting quick floor rearrangement as projects change; (b) They are of convenient height; students operate them more easily; (c) They are fully safeguarded (Delta tools meet the acknowledged rigid provisions of the Wisconsin Industrial Commission).

Be instrumental in raising the standards of your shop program. Help to provide your students with modern facilities for their work, by specifying Delta Machine Tools on your requisition for metalworking and woodworking equipment.

Delta Manufacturing Division
Rockwell Manufacturing Company
Milwaukee 1, Wisconsin

Tear out coupon and mail today!

DELTA MANUFACTURING DIVISION
660D E. Vienna Ave., Milwaukee 1, Wis.

Send me Catalog B-15 describing low-cost Delta Machine Tools.

Name.....
Position.....
School.....
Address.....
City.....(.....) State.....

5-34

(Continued from page 182)

The four sessions planned for Friday, April 25, are for the alert teachers and for those students, teachers, and administrators who aspire to be in the vanguard of their profession. This is well illustrated by the opening or fourth session which will be a presentation of the new industrial-arts curriculum by six exceptionally able young men, each of whom also happens to be a veteran of World War II. They plan, naturally, to use graphic aids in each of their presentations, the first of which will be on, "The Development of a Curriculum That Will Reflect Technology." This will be followed by presentations on: "Organization of the Program," "Possibilities of the *Power* Division," "Possibilities of the *Transportation* Division," "Possibilities of the *Communications* Division," "Possibilities of the *Construction* Division," and "Possibilities of the *Manufacturing* Division." The Fifth Session is planned as a luncheon where seasoned leaders from several states can react concerning the problems attendant to the introduction and use of the new curriculum.

The Sixth Session will be devoted to America's educational headache, the one-man and/or county system industrial-arts program, but it has been so organized this year as to be one of the principal features of the convention. Each of the 88 county superintendents of schools of Ohio has been invited by the State Department to display examples of (*a*) student work, (*b*) shop plans or layouts, and (*c*) evidences of a county-wide program for which first, second, and third prizes in the form of distinctive plaques can be awarded. Five speakers will make their presentations in the midst of these displays as follows: "What is the Extent of a One-Man Program?" "What Should Be Included in a One-Man Laboratory Installation?" "How Should a One-Man Laboratory Be Organized and Operated?" "How Should a County Program Be Organized and Operated?" and "What Are the Administrative and Supervisory Responsibilities of the County Office?"

The seventh session is the fellowship banquet of Epsilon Pi Tau where the features are to be "New Developments in Industry" that the professional research men feel will affect industrial arts, and the new "National Industrial Arts Fair" to be launched this summer in the Museum of Science and Industry in Chicago by the Scholastics Corporation of New York City in behalf of American industry and the schools. The directors of the fair from New York City as well as several members of the national advisory board will be present and speak.

The three sessions on Saturday, April 26, will be of interest and concern to everyone. They open with the eighth session and a series of presentations by leaders of the association that will be considered for inclusion in the publication concerning the American industrial-arts program. Some of the topics include: "A Definition of Industrial Arts and Its Objectives," "The Scope or Levels of the Program in Action," "The Industrial Arts Curriculum in Transition," "Organizational and Administrative Problems," and "Problems in the Development of the Profession." Of especial significance will be the concluding remarks to be made by the director of research of the National Education Association of the United States.

The ninth or business sessions and the tenth or commercial exhibitors' sessions will be devoted to a consideration of several significant resolutions, to the election of officers, and especially to the awarding of plaques in the county program competition and of commercial prizes to the holders of lucky cards.

♦ Joseph R. Strobel, Ohio State Director of Vocational Education, spoke on "The Relation of Vocational Education to the Total School Program" at a Town Hall meeting at the Dayton Art Institute Thursday, January 16. The meeting, sponsored by the Dayton Club of Printing House Craftsmen, included a panel of 25 labor, industrial, civic, and educational leaders for the discussion period.

Mr. Strobel, saying that education was always 50 years out of date, outlined the present trends in vocational education and the tendency for vocational education to rise in the grade levels and industrial arts to reach the younger pupils.

Printing Education Week, annually celebrated in the week in which Benjamin Franklin's Birthday, January 17, falls, was the occasion of the meeting. Howard Massman, co-ordinator of printing at Parker Vocational School, and secretary of the Craftsmen's Club, was moderator of the meeting.

Dayton Club of Printing House Craftsmen Meeting.

Left to right: Howard Massman, secretary, Dayton Craftsmen's Club and printing trades coordinator at Parker Vocational School; Joseph R. Strobel, Ohio director of vocational education; Mrs. Ralph Krisher, member of the Board of Education; and Howard T. Randolph, president, Dayton Club of Printing House Craftsmen.

The committee on arrangements was made up of Mr. Massman and J. W. Harris, Parker Vocational School; Clippinger, Jr., Kiser High School; John Behrle, Reynolds & Reynolds Company; Lester Giele, Giele & Pflaum Printing Company; and Howard T. Randolph, West Carrollton Parchment Company.

Mayor Edward Breen issued a proclamation of the week, radio stations carried related programs, the Dayton Public Library had a special exhibit, and the Dayton papers all devoted space to the event.

FIRST GIRL IN EPSILON PI TAU

At a formal initiation banquet on February 15, Miss Lillian Tucker became the first woman to be admitted to the national honorary industrial arts fraternity, Epsilon Pi Tau.

Dr. Gordon O. Wilber, director of Oswego's division of industrial arts, presenting the key to Miss Lillian Tucker

Miss Tucker was graduated from the Oswego State Teachers College, Oswego, N. Y., in June, 1946, with an outstanding scholastic record and a major in industrial arts. She thus became the first girl to receive an industrial-arts degree from Oswego. She then accepted a postion in Rochester, N. Y., where she is supervising the elementary industrial-arts program in several of the city's schools.

The Epsilon Pi Tau initiates at Oswego, February 15, 1947

Front row, left to right: Jack E. Gaffield, Thomas H. Richardson, Miss Lillian Tucker, D. George Buso, Arthur E. Darcy. Second row: G. Earl Hay, Arthur D. Dunn, Robert L. Hatcher, Austin W. Blake, Frederic S. Ford. Third row: Henry J. Gasket, Harold G. Ludwig, Donald E. Bamberger, Gerald B. Jacobs.

At the same banquet, 13 other members were also installed in Oswego's Pi chapter. The initiates are shown in the accompanying illustration.

♦ Zeta Chapter, Epsilon Pi Tau, held its first 1947 "Banquet and Initiation Program" on the campus of the Northern Illinois State Teachers College, DeKalb, Ill., on Saturday, February 8. The program was arranged as follows:

2:00 p.m. Visit shops and friends in industrial-arts building.
3:00 p.m. Oral examination of candidates.
4:00 p.m. Initiation ceremony.
6:00 p.m. Banquet at the Rice Hotel.
7:00 p.m. Presentation of keys.
7:30 p.m. Ernest J. Simon (an initiate), state director of vocational education, Springfield, Ill., spoke on the problems confronting industrial arts and vocational education in Illinois.

♦ The first national high school industrial-arts fair will be held from August 17 to September 7 in the Chicago Museum of Science and Industry.

For further information write to Scholastic Magazines, 220 E. 42nd St., New York 17, N. Y.

♦ One of the highlights of the annual banquet of the National 4-H Club Congress at the Stevens Hotel, Chicago, recently was the presentation of a $200 college scholarship to Dick Waldow, South St. Paul by the Victor Animatograph Corporation, Davenport, Iowa. A similar award went to Naurice Koonce, Tucson, Ariz., who was unable to attend the Congress.

The awards, set up this year by S. G. Rose, vice-president of the Victor Corporation for the furtherance of study in visual education, may be used at any state agricultural college in the United States or any other college of the winner's choice upon application to the National Committee on Boys and Girls Club Work.

Koonce and Waldow have established outstanding records both in 4-H Club work and in the visual education field.

Waldow, who figures his 4-H Club projects have grossed him $1,863, started his visual aids project in 1941 with money received from soil conservation practices. During the eight years he has been in club work he has carried practically all projects offered boys. He found it easy to operate his camera and 16mm. projector and is a firm believer in teaching club members as well as adults through means of visual aid. He has aided fellow workers in judging contests by showing them pictures of themselves in action.

(Continued on page 16A)

With Enrollment Up

LOOK

for

Space Saving Features

IMMEDIATE DELIVERY

4 Vise Type

WOODWORKING BENCH TOP

Provides Four Individual Work Stations

This woodworking bench provides four work stations in a space usually occupied by one without limiting students freedom of movement. Its large, flat, hard maple top is fitted with a vise at each corner enabling four boys to work simultaneously. The bench is reinforced at each vise end with a heavy 5" bolster or batten, firmly secured to the top with a mortise and tenion joint anchored by a 7" bolt — thus giving a solid indestructible foundation for each vise.

To produce a bench top of this size, elaborate drying equipment and trained craftsmen are necessary. Two years or more are required to put this maple through the seasoning and drying process essential for structural stability in a top of this size.

The working surface is perfectly smooth and flat. The bench is guaranteed against warping or cracking, being reinforced by heavy bolts passing through the top from one side to another.

Its basic construction is of carefully built-up maple strips joined with a special waterproof glue, resulting in joints that are stronger than the wood itself.

Specifications:

Woodworking Bench — 4 vise type

Bench Top: 54" x 64" x 2¼"; seasoned, kiln dried, hard maple.

Vise: 4 Columbian No. 5CD, anchored to a heavy reinforced 5" batten, firmly secured and anchored with a 7" bolt — providing a solid virtually indestructible foundation.

SHIPPED FREIGHT PREPAID

$115.00

TOP and VISES ONLY

BRODHEAD GARRETT CO.

SUPPLYING TRAINING NEEDS TO SCHOOLS IN ALL 48 STATES.

BRODHEAD-GARRETT CO., 4560 E. 71st St. Cleveland 5, Ohio

Add the right STARRETT TOOL

And in the school shop or training class, the right Starrett Tools are equally important for they inspire the confidence of the boys who use them — help them make the most of their growing skill and experience. Be sure to specify **Starrett** when you requisition precision measuring tools. Your tool dealer can show you a complete selection priced to fit your budget.

Add The Starrett Book For Student Machinists, Too

Full of practical, useful information about tools, machines and modern metal working methods, plus many handy reference tables, it's a great help to students and a handy reference for old hands. Only 75c per copy at your Starrett Tool distributors. Write for descriptive folder "CE."

THE L. S. STARRETT CO., ATHOL, MASSACHUSETTS, U. S. A.

World's Greatest Toolmakers

STARRETT TOOLS

Precision Tools • Dial Indicators • Steel Tapes • Ground Flat Stock
Hacksaws • Band Saws for Cutting Metal, Wood, Plastics

(Continued from page 14A)

Koonce has turned his hobby of taking pictures into a profitable enterprise. His photographic experiences in 4-H Club work may result in his finding his life's work as he has already received employment with a photographic firm. He will make use of his newly won Victor scholarship at the University of Arizona.

♦ The outstanding event in Pennsylvania's industrial-arts program is the annual spring conference that is held alternately at Millersville and California.

The Pennsylvania Industrial Arts Conference will be held at California on Saturday, April 26, 1947. The theme of the program will be "Improving Industrial Arts in Pennsylvania."

♦ Pi Lambda Theta, National Association for Women in Education, is again this year announcing the granting of two awards of $400 each for significant research studies on "Professional Problems of Women." The two awards for last year were granted to: Helga Stene, Oslo, Norway, for *Glimpses of Women's Political Activities in an Occupied Country*, and Alice I. Bryan, Columbia University, and Edwin G. Boring, Harvard University (joint authors) for *Women in American Psychology: Factors Affecting Their Professional Careers.* — Bess Goodykoontz, chairman,, Committee on Studies and Awards, % U. S. Office of Education, Washington 25, D. C.

News Notes

♦ The "Time Table of Classes" recently issued by the Pennsylvania State College announces a variety of courses to be offered teachers, supervisors, and administrators in agricultural education, home economics, and industrial education.

The main summer session will begin on June 30 and close on August 9, and will be preceded by the intersession, June 10–27, and followed by three postsessions conducted during the period August 11–September 20.

Copy of the complete announcement can be had upon request to the Director of Summer Sessions, The Pennsylvania State College, State College, Pa.

♦ Research fellowships totaling $20,500 have been awarded to 14 graduate students by the General Electric Educational Fund, it was announced lately by A. D. Marshall, secretary of the fund and assistant secretary of the company.

Eight of the winners received Charles A. Coffin Fellowships awarded for research in the fields of electricity, physics, and physical chemistry. They are given in honor of Mr. Coffin, who was the first president and one of the founders of the General Electric Company. The other six young men obtained Gerard Swope Fellowships for advanced study in industrial management, engineering, and physical sciences, and other scientific and industrial fields. Mr. Swope, the third president of G.E., is now honorary president.

The awards are granted annually to graduates of universities, colleges, and technical schools of the United States who have shown, by the character of their work, that they could with advantage undertake or continue research work in educational institutions either in this country or abroad. The fellowship recipients are granted an amount up to a maximum of $1,500 annually.

♦ The Broaching Tool Institute now offers three 16mm. motion picture sound films to manufacturers who wish to educate their employees on the various phases of broaching and broaching technique. They are also available for use in technical society meetings and in technical schools. These training films were produced during the war by the United States Office of Education and have been released to the Broaching Tool Institute for showing.

Film No. 1 is titled "Broaching an Internal Keyway"; film No. 2, "Single Ram Vertical Surface Broaching"; and film No. 3, "Double Ram Vertical Surface Broaching."

All three of these films show how the work can be done in a very simple manner.

Any manufacturer, technical society, or technical school can arrange for the use of these films without charge by writing to the Broaching Tool Institute, 74 Trinity Place, New York 6, N. Y.

♦ Structural materials used in jet engines, gas turbines, and other power plants by the army air forces and methods and equipment employed in navy engineering will be examined by scientists at Syracuse University's Institute of Industrial Research.

Forty-seven thousand dollars in government contracts has been awarded the University's College of Applied Science for industrial research under the leadership of Dr. Ralph E. Montonna, director of the institute. Dr. B. J. Lazan, chief of the college's Materials Testing Laboratory, will have direct control of the investigations.

The institute was organized late in 1946 to conduct research in numerous fields as assistance to business and industrial interests. Housed in buildings which were formerly part of the $20,000,000 General Electric Plant in Syracuse, it is expected to develop into one of the foremost centers of research in the United States.

Dr. Montonna joined the organization December 1, 1946, bringing wide experience in industrial science and education. His major research interest has been in cellulose chemistry, particularly the effect of light on cellulose and its derivatives. Prior to coming to Syracuse, he was director of the Minnesota Institute of Research and assistant dean of Graduate School, University of Minnesota.

♦ The official Soap Box Derby will be run in 133 towns and cities in the United States and

(Continued on page 18A)

PROMOTES SKILL...
FINE DETAIL WORK MADE EASY

A WHOLE SHOP FULL OF TOOLS IN ONE!

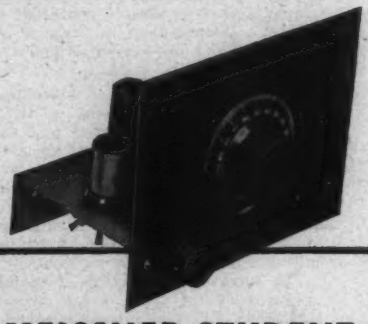
WORKS WOOD, GLASS, METAL, PLASTIC

A precision-built tool for master mechanics and craftsmen. Unsurpassed for grinding, drilling, routing, carving, sawing, finishing and 9,994 other uses. Runs on AC-DC, with more exclusive features than any other tool.

Exclusive finger-grip brings hand closer for finer work.

COMPLETE WITH 36 ACCESSORIES IN FITTED STEEL CASE
$22.50
$31.75 Value If Purchased Separately

CASCO ELECTRI-CRAFT TOOL KIT
CASCO PRODUCTS CORPORATION, BRIDGEPORT 2, CONN.



MEISSNER STUDENT KITS

...for practical radio instruction at low cost will be again available when present manufacturing conditions permit.

"How To Build" instruction manual, the ideal laboratory textbook, an invaluable reference manual for all radio students. Fifty cents, postpaid (seventy-five cents in Canada)

ELECTRONIC DISTRIBUTOR AND INDUSTRIAL SALES DEPARTMENT, MAGUIRE INDUSTRIES, INCORPORATED
910 NORTH MICHIGAN AVENUE, CHICAGO 11, ILLINOIS

...for Stanley-Carter Routers

WITH this new Carter Base a single knob lets you lock, unlock, set or *slide the motor out.* Now you can make micro settings for different depth cuts faster and easier.

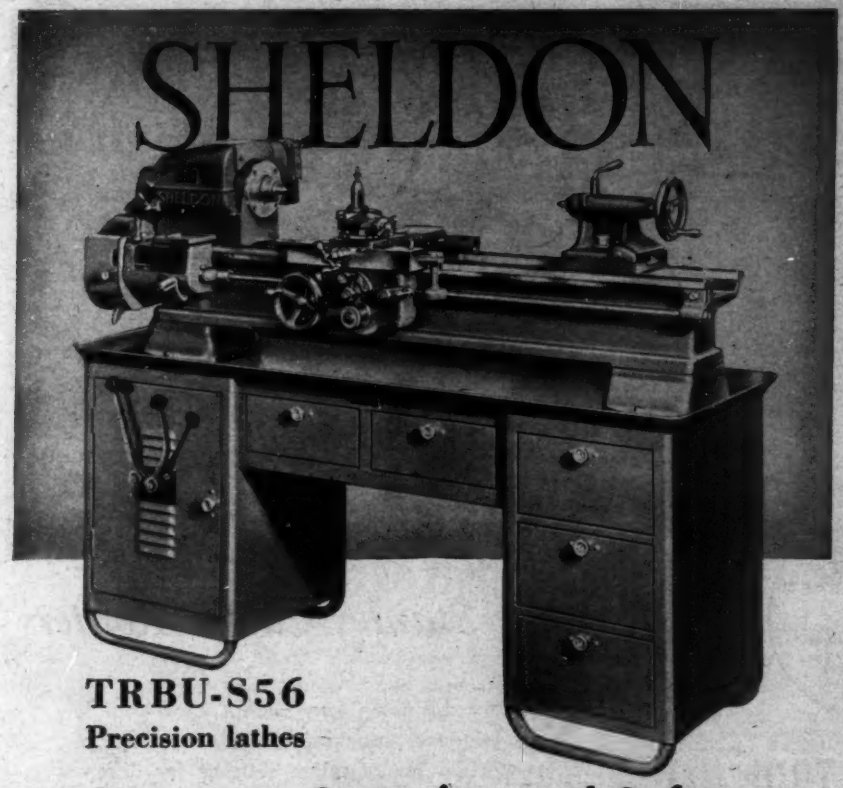
A turn of the knob to the right locks the motor firmly to the base . . . a half turn to the left engages the exclusive Carter Calibrated Thread Adjustment . . . and a full turn to the left permits you to *slide* the motor up or down for quick depth adjustments.

This new base combines the advantages of precision-calibrated threading with that of speed and ease of adjustment. One turn of the motor changes the depth of the cut *exactly* 1/16" . . . a quarter-turn, 1/64". There are 16 threads per inch, making it easy to set the unit for any desired cut.

Write for full information on this latest Carter improvement. Stanley Electric Tools, Stanley-Carter Sales Department, 112 Elm Street, New Britain, Connecticut.

STANLEY
Trade Mark

HARDWARE · HAND TOOLS · ELECTRIC TOOLS



TRBU-S56
Precision lathes

Accuracy, Capacity and Safety

Because this is an age of precision machining of ever closer tolerances, any practical course in machine shop should stress and demonstrate accuracy. Among lathes that can come within the average school budget, the Sheldon TRBU-S56 is outstanding. Here is a moderate priced lathe with accuracy features of the largest and most costly lathes. "Zero Precision" Taper Roller Bearings, one of the finest bearings obtainable, permits this lathe to work to the very closest tolerances over a full range of speeds. A true industrial tool room lathe, TRBU-S56 has industrial capacity—11¼" swing, 1" collet capacity and standard industrial features and controls.

But of greatest importance to any school is its *Safety*. To assure utmost safety the headstock and drive are entirely enclosed and speed changes are controlled with external levers. It also comes on modern steel bench with 5 individually locking drawers for tools, aprons, drawings and work.

SHELDON MACHINE CO. Inc.
Manufacturers of Sheldon Precision Lathes • Milling Machines • Shapers
4258 N. KNOX AVENUE • CHICAGO 41, ILLINOIS, U. S. A.

(Continued from page 16A)

Canada in 1947 — more communities than have ever before participated in the "greatest amateur racing event in the world." Twenty-eight of the cities are staging the derby for the first time.

The derby is sponsored by America's leading newspapers and by the Chevrolet Motor Division. Myron E. Scott, assistant advertising manager of Chevrolet, is the national Soap Box Derby director.

The races will be held in June, July, or early August, and a champion will be chosen, to make the trip to Akron for the national and international finals.

Rule books, official entry blanks, and drivers' licenses which are to be given to all applicants, may be obtained from the various Chevrolet dealers at the opening of the derby campaign in the 130 cities where there is a sponsoring newspaper or other organization.

♦ The Chemical Publishing Co. Inc., 26 Court St., Brooklyn 2, N. Y., have just issued their 1947 catalog covering books on chemistry, technology, physics, general science, mathematics, engineering, foods, formularies, drugs and cosmetics, medicine, metals, technical dictionaries, etc., as well as college and other textbooks. A free copy of this catalog may be obtained on application.

♦ Burgess Battery Co., 180 North Wabash Ave., Chicago, Ill., have entered into the model airplane manufacturing business.

The first of the Burgess M-5's, as the engines are called, have already been released to the model building field. Manufacturing rights to the engine were purchased last year from the Morton Aircraft Corp. of Omaha.

The Burgess M-5 is an exact scaled replica of its LeBlond original. It is 5⅜in. in diameter, weighs 22 ounces, and develops ½ horsepower.

♦ The Haeger Potteries, Inc., Dundee, Ill., have announced details of the Haeger Awards for ceramic design, as part of the company's 75th anniversary celebration. A total of $2,000 in prizes will be awarded for pottery designs best suited to large-scale production.

Entries are solicited from anyone living in the United States and it is expected that a majority of the entrants will be professional artists, designers, and art students.

Finished ceramic works are the desired entries for the competition, but those lacking firing facilities may submit drawings of designs for equal consideration by the jury.

The Haeger Awards jury, comprised of independent experts, will meet in Chicago during the early part of September to review entries and select award winners.

A circular of information giving complete details on rules governing the competition is available from the Dundee office of The Haeger Potteries, Inc.

♦ Ralph H. Beard, of the New York Telephone Company, has received the 1947 Award of the Duodecimal Society of America, 20 Carlton Pl., Staten Island 4, N. Y., for outstanding service to mathematical research with relation to the duodecimal number system.

Mr. Beard is editor of *The Duodecimal Bulletin* and has published a number of articles in the field of duodecimal mathematics, among which is his "The Do-Metric System." This is a proposal for a unified system of weights and measures bearing close relation to the systems now in common use but co-ordinated on the dozen base. The Do-metric System, he claims, would retain the practical advantages of our present units, and add all the conversion advantages of a unified system through basing its units on counting by dozens.

♦ A three-inch transit telescope was presented recently to the Warner & Swasey Observatory at Cleveland, Ohio, by the Bausch & Lomb Optical Company.

Formerly housed in the optical firm's observatory here, the telescope and recording micrometer were used to observe transit of stars in determining sidereal time. In its new location the instrument will be used principally for instructional purposes.

♦ A new catalog has been published by Castle Films, authorized distributor of U. S. Government visual aids, listing many new films released during the past year for school and industrial training purposes. There are now available 730 sound motion pictures on 16mm. film and 585 film strips for 35mm. slide-film projectors to aid in teaching a great variety of skills from nursing to shipbuilding, with many films dealing with engineering and scientific subjects.

The catalogued collection of visual aids were produced by the U. S. Department of Agriculture, U. S. Office of Education, U. S. Navy and War Departments, U. S. Public Health Service, Civil Aeronautics Administration, and Veterans Administration.

For a copy of the catalog, address Castle Films Division of United World Films, Inc., at 30 Rockefeller Plaza, New York 20, N. Y.

♦ The Institute of Design, in Chicago, announces the appointment of Serge Chermayeff, A.I.A., F.R.I.B.A., as its new president and director to replace the late L. Moholy-Nagy. Chermayeff, since 1942 has been professor of architecture and chairman of the Department of Design at Brooklyn College.

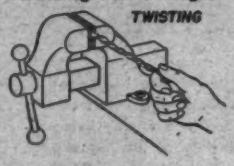
In the past eight years, the Institute of Design has grown from a student enrollment of 70 to over 700 students today, all of whom study in the Foundation Course such subjects as sculpture, painting, drawing, photography, and workshop, and in their advanced years specialize in architecture, product design, textile design, photography, and visual design.

The Institute of Design was first organized in 1937 under the direction of L. Moholy-Nagy. It was located at that time in the old Marshall Field

(Continued on page 31A)

NEW BOOK *for those who are working with* PLEXIGLAS

Illustration No. 40 from "Working with Plexiglas"



The new wonder plastic that easily saws, twists, bends, carves, glues and polishes. Every day craftsmen find new articles to make by processes never before thought possible.

Immediate delivery on the Best Instruction Book ever published entitled . . .

"WORKING WITH PLEXIGLAS"

Published by the makers of Plexiglas, this book will solve your problems of fabrication. Each process carefully explained with special drawings showing every step. Designed to aid schools and the home craftsman . . . manufacturers will also find new methods to aid in production.

- Over 100 illustrations
- Contains 72 pages
- Over 30 suggested projects
- Size 8½" by 11"

"WORKING with PLEXIGLAS" $1.50 post-paid
(Special price when ordered by schools)

Craft Service carries a complete stock of sheets, rods, polishes, glues, etc.

Write for FREE new price lists showing 1947 Price Reductions

CRAFT SERVICE Over a DECADE of SERVICE
333 University Avenue Rochester 7, N. Y.

WEBER
TRADE MARK REG. U.S. PAT. OFF

ARTIST and DRAWING MATERIALS

FOR MECHANICAL DRAWING:

Drawing Instruments
Drafting Supplies
Waterproof Drawing Ink

FOR ART AND COMMERCIAL ART:

Fine Artist Quality Colors in all mediums, and Related Products.

STUDIO, SCHOOL AND DRAFTING ROOM FURNITURE

Manufactured by

Catalog Vol. 700 to Teachers and Schools, on Request.

F. WEBER CO.
Est. 1853
PHILADELPHIA 23, PA.
ST. LOUIS 1, MO. BALTIMORE 1, MD.

PATRONIZE YOUR NEAREST WEBER DEALER

CLASSROOM *Teaching Aids* by WESTON

LARGE COLORFUL WALL CHARTS

completely illustrating the three basic types of instrument movements... Phantom views showing details of construction and operation.

INDIVIDUAL CHARTS

Notebook-size reproductions of the large wall chart. Available for distribution to individual students.

MONOGRAPH NUMBER 3, ON ELECTRICITY

covers suggested approaches to teaching this subject in secondary electrical, electronics and science classes.

In writing for these teaching aids simply state school and class in which they will be used. Weston Electrical Instrument Corporation, 595 Frelinghuysen Avenue, Newark 5, New Jersey.

WESTON *Instruments*

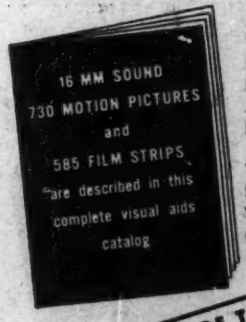
PANEL, PORTABLE, AND LABORATORY INSTRUMENTS • TUBE CHECKERS
TEST EQUIPMENT • ILLUMINATION METERS • SENSITIVE RELAYS
THERMOMETERS • PHOTRONIC CELLS

JUST OFF THE PRESS, this big new catalog describes the largest and most important group of visual aids for classroom and factory use yet produced. These low-cost training films are being widely used all over America in teaching thousands of workers and students in many fields.

They were produced by the U. S. Office of Education and other Government agencies with the complete cooperation of the foremost authorities in education and industry.

You, too, can make your teaching of difficult concepts and principles—your training of workers, easier and more effective by using these 16 mm sound motion pictures. Aid your students and trainees to *learn faster!*

A FEW EXAMPLES OF THE MANY SUBJECTS AVAILABLE



- Fundamentals of Side Cutting Tools
- Turning a Cylinder Between Centers
- Film Tactics (use of teaching films)
- Damage Control: The Chemistry of Fire
- Advanced Typing: Shortcuts
- Radio Receivers: Principles of Radio Receivers
- Trouble Shooting Your Car
- Single Phase and Polyphase Circuits
- The Airplane Mechanic
- Origin and Synthesis of Plastics Materials

NOTE: SUPPLY OF THIS 40-PAGE CATALOG IS EXTREMELY LIMITED . . . WRITE FOR YOUR COPY *Today!*

CASTLE FILMS INC

Distributors for U. S. OFFICE OF EDUCATION

Castle Films, Inc., 30 Rockefeller Plaza, New York 20, N. Y. IA-4
Please send me FREE COPY of the NEW 1947 CATALOG describing 730 Motion Pictures and 585 Film Strips.

Name_____

Street_____

City & State_____

Detroit Public Library

SHOP BOOKS

GENERAL PRINTING

BY CLEETIN & PITKIN

★ Rated a superior text by those who have used it. Gives instructions on basic fundamentals and shows importance of printing in everyday living. Also contains interesting history of the industry. $1.60

GENERAL BOOKBINDING

BY GRONEMAN

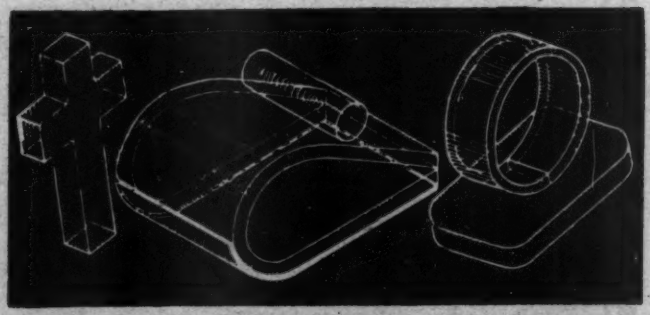
★ A simple manual with emphasis on binding magazines and other school forms. Gives instruction for the construction of equipment. A new chapter on care of books. $1.00

GENERAL PLASTICS

★ This book contains many new projects that can be easily made by the beginning craft-worker. A clear step-by-step procedure in constructing each project is supplemented by many photographs that show how the operations are done. Tells how to glue, inlay and polish. $1.20

McKNIGHT & McKNIGHT

BLOOMINGTON ILLINOIS



YOUR STUDENTS WILL LIKE PROJECTS IN PLASTICS

Plastics are simple to cut, shape, carve and dye. With easy-to-learn skill, your students can produce professional-appearing projects that will win exclamations of admiration from their friends and parents.

HANDBOOK TELLS HOW TO FABRICATE PLASTICS

The new Carmen Bronson PLASTICS HANDBOOK describes in detail the professional techniques of fabricating Plexiglas, Lucite, Bakelite, Polystyrene, Lignolite and other plastics. It discusses business opportunities in the plastics field; and gives working plans for many simple and advanced construction projects.

CATALOG LISTS ALL MATERIALS

The Carmen-Bronson CATALOG gives you complete prices and data on all the materials you need for classroom use. Plexiglas, Lucite, Bakelite, Lumarith, Lignolite, Tenite, Polystyrene, etc. in sheets, rods, tubes and special forms—crystal-clear and in many rich, glowing colors. Also lists numerous cements, dyes, compounds, accessories, supplies and semi-fabricated kits. Extra low prices—plus large discounts for quantity purchases!

GET CATALOG AND HANDBOOK FREE!

The Carmen-Bronson CATALOG, and a copy of the Carmen-Bronson PLASTICS HANDBOOK, will be sent without charge to any shopwork instructor or school purchasing agent. Request your copies of these important books at once!

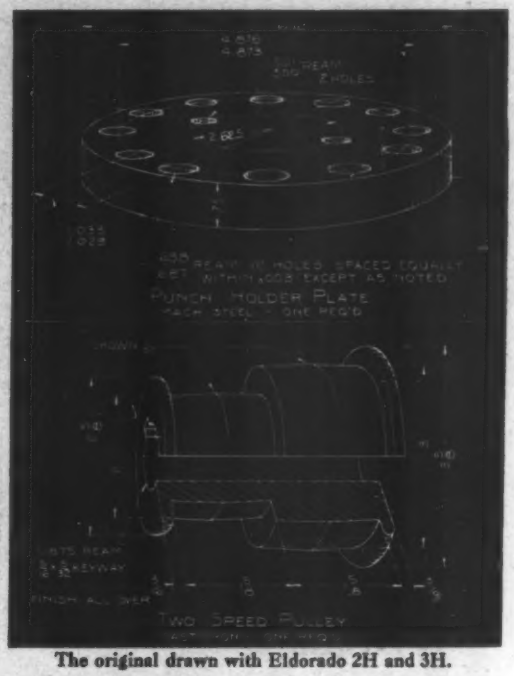
CARMEN-BRONSON COMPANY

165 EAST 3rd STREET, DEPT. 4V MOUNT VERNON, N. Y.

CIRCLES
and parts of Circles

Here are problems which continue Dixon's original and exclusive Eldoradostat service for instructors in strikingly useful lessons in circles. Have your class work out correct orthographic solutions.

Start them off right in pencils — by starting them with TYPHONITE ELDORADO pencils . . . the most dependable and responsive of drawing tools whose easy leads do not feather or crumble. Eldorado's uniformity in degree of hardness assures technique of line, which marks the good drawing.



The original drawn with Eldorado 2H and 3H.

Solution: We'll gladly send you free ELDORADOSTATS of these problems and solutions, from which you can make blueprints for classroom distribution. Get your name on our mailing list by writing to the address below.

DIXON'S *TYPHONITE* ELDORADO

SCHOOL BUREAU, PENCIL SALES DEPT. 127-J4, JOSEPH DIXON CRUCIBLE CO., JERSEY CITY 3, N. J.

(Continued from page 18A)

residence on Prairie Avenue. It now occupies its own building containing well-equipped workshops and studios which are among the finest in the country.

♦ National Boys and Girls Week will be observed from April 26 to May 3, 1947. The celebration will mark the 27th annual observance of this important youth event.

With the theme, "Youth — the Trustees of Posterity," the program is designed to focus the attention of the public on the problems, interests, and recreations of youth, and on the part played by the home, church, school, and youth-serving organizations in the development of character and good citizenship in growing boys and girls.

Daily programs suggested for the week include:

Citizenship Day — Saturday, April 26
Day in Church — Sunday, April 27
Day in Schools — Monday, April 28
Family Day — Tuesday, April 29
United Nations Day — Wednesday, April 30
Child Health and Safety Day — Thursday, May 1
Careers Day — Friday, May 2
Day of Recreation — Saturday, May 3

Information about Boys and Girls Week, and helpful suggestions for carrying out the program of the week, including a poster and a Manual of Suggestions, may be obtained free of charge from the National Boys and Girls Week Committee, 35 E. Wacker Drive, Chicago 1, Ill.

♦ Before Francis Modlin, high school printing instructor, at Arkansas City joined the armed forces, the Ink Slingers Club flourished in that school. The club has now been reorganized with 14 junior college and high school day trade boys as the new membership. The high school boys are required to have a grade average of B to be eligible. Each member carries a membership certificate signed by the president and sponsor.

New Publications

Exploring the Industries

By Chris H. Groneman and E. L. Williams. Paper cover, 160 pp., 8⅛ by 11 in., illus., 70 cents. The Steck Company, Austin, Tex.

A book designed for pupils who are in their first year of industrial arts. The subjects covered are: wood, bench metal, forging, sheet metal, art metal, and electricity.

Each division is complete and includes material in detailed form on tools, processes, and problems for the pupil to check on his own progress. Many individual projects provide an adequate outlet for the pupil's creative energies. Numerous photographs are used to show what people do to make a living in various industrial fields.

Precision Hole Location

By J. Robert Moore. Cloth, 448 pp., 7⅛ by 10¼ in., illus., $3. Published by the Moore Special Tool Company, Bridgeport, Conn.

A well-prepared book on a weighty subject. Interchangeability in toolmaking and production have made America what it is.

In spite of paying the American mechanic more than workers are paid in other countries, we have still been able to compete with them in the markets of the world. American precision engineering has made this possible and this book shows how this precision work is done.

The book is very readable and well illustrated.

Your Craft Book

By Louis V. Newkirk and LaVada Zutter. Cloth, 212 pp., 8¾ by 11 in., illus., $4. International Textbook Company, Scranton, Pa.

A book of craft projects that will please pupils from the lower grades up to those in the high school.

The contents cover toys and games, projects for the holidays, human and animal marionette puppets, simple needle and thread projects, clay modeling, simple musical instruments, and a number of gift suggestions.

The book presents 108 well-designed projects all of which are accompanied by clear directions and excellent illustrations.

Management Techniques for Foremen

By Richard W. Wetherill. Leatherette, spiral binding, 177 pp., 8½ by 11 in., $7.50. National Foremen's Institute, Inc., Deep River, Conn.

A book in answer and question form which tells the foreman what his responsibilities are, the specific knowledge which he should possess, how he should line up his jobs, how he is to fit the new worker into the department, how to train him and teach him safety practices, how to maintain the quality and quantity of the product while holding or reducing established costs, how to use and care for the machinery and equipment, and how to manage those under his charge.

Rate problems, labor relations, discipline, and co-operation also are discussed.

Raising Turkeys, Ducks, Geese, and Game Birds

By Morley A. Jull. Cloth, 467 pp., 6¼ by 9⅛ in., illus., $2.80. McGraw-Hill Book Co., New York, N. Y.

This book is one of the McGraw-Hill Rural Activities Series. It contains comprehensive information on breeding, renewing flocks, feeding, controlling parasites and diseases, and marketing turkeys, ducks, geese, guineas, pigeons, peafowl, and game birds.

The book also shows what must be done to build up a successful turkey enterprise.

Elementary Radio Servicing

By William R. Wellman. Cloth, 260 pp., 6⅛ by 9¼ in., illus. D. Van Nostrand Co., New York City.

A book for those who have studied the prin-

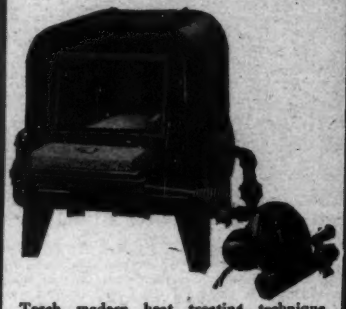
(Continued on page 28A)

Quick Acting
JOHNSON FURNACES

NOW YOU CAN TEACH A WIDE RANGE OF HEAT TREATING

JOHNSON Hi-Speed No. 70 Hardens ANY Steels

Heats up FAST to allow more actual classroom time



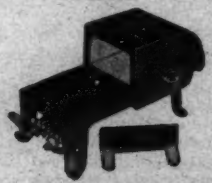
Teach modern heat treating technique with this widely used industrial unit. *Quick Acting* JOHNSON Hi-Speed No. 70 gives you the range of temperatures needed to heat treat high speed steels, hardox high carbon steel tools and dies, or for brazing carbide tipped tools. This compact, powerful, and highly efficient furnace is most economical to operate. It develops 1500° F. in five minutes and 2250° F. in 30 minutes to save both time and gas. Temperatures are easily regulated. Firebox 5 x 7½ x 9 is lined with high temperature insulating refractory. Complete with Carborfrax Hearth, GE Motor and Johnson Blower. Priced to fit school budgets at only

$15.50 — F.O.B. Factory

ORDER NOW.

JOHNSON No. 101 Bench Furnace

Delivers up to 1800° F. without a blower



A most powerful, efficient and economical bench furnace for heating soldering coppers up to 12 pounds per pair. Used in many shops for heat treating, annealing, and case hardening carbon steels. Firebox 3¼ x 4½ x 5½. Complete with work rest block and baffle plate.

$15.50 — F.O.B. Factory

Renew the efficiency of your present JOHNSON Furnaces. Write for particulars and prices on Factory Rebuilding.

FREE CATALOG . . . SEND COUPON

JOHNSON GAS APPLIANCE CO.
885 E Avs. N. W., Cedar Rapids, Iowa

Name _____

Address _____

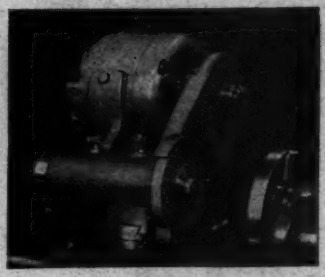
City _____ Zone _____ State _____

Shop Equipment News

NEW PRODUCTS — PUBLICATIONS

NEW LATHE GRINDING ATTACHMENT

A new electric grinding attachment for use on lathes and other machine tools has been developed by the South Bend Lathe Works. Designed primarily for external grinding, it is equipped with a 4 by ½-in. grinding wheel which is driven by a constant speed continuous duty ¼ h.p. motor. While made especially to fit the various sizes of South Bend Lathes, this grinding attachment also can be adapted to other makes of lathes, milling machines, shapers, planers, etc.



Electric grinder mounted on compound rest on lathe

The grinding wheel spindle runs on prelubricated sealed precision ball bearings which require no adjustment or additional lubrication. Tension adjustment is provided for the V belt which connects the motor with the grinding wheel spindle. Both the grinding wheel and the V belt are enclosed in a single guard.

Spring stops for grinding straight and spiral fluted reamers and cutters, diamond dressers for truing the grinding wheel, and holding fixtures for the dressers can be furnished for use with this grinding attachment.

For more complete information, catalog, and prices of this grinding attachment, write to the South Bend Lathe Works, 178 E. Madison St., South Bend 22, Ind.

For brief reference use IAVE — 0401.

A.T.F. WALL CHARTS

The American Type Founders, department of Education, has completed a revised set of 24 printing instruction wall charts. Each chart illustrates a basic step in setting, proofing, and handling type. The 11 by 14-in. charts are printed on lightweight cardboard, and are neatly packed in a carton. They are priced at $2.50 per set and may be ordered from the nearest A.T.F. branch. For further detailed illustrative information write American Type Founders, Department of Education, Elizabeth B, N. J.

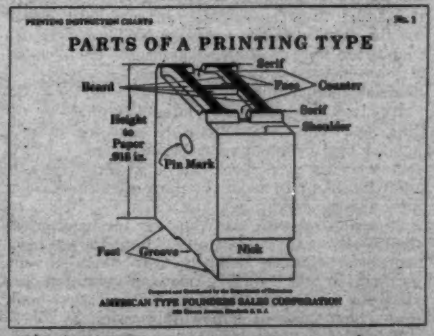


Plate 1, ATF printing instruction charts. The original measures 14 by 11 in.

For brief reference use IAVE — 0402.

NEW PHENOL-TYPE ADHESIVE

A new phenol-type adhesive has been developed by the Casein Company of America, Division of the Borden Company, 350 Madison Ave., New York 17, N. Y. It is especially formulated for bonding wood with radio-frequency equipment. The product is called Cascophen RS-228. The new product eliminates one of the worst *bugs* in gluing with dielectric heat. It does not arc when electrodes come in contact with the squeeze-out of glue or with the glue line itself. At the same time, Cascophen RS-228 allows the use of maximum power to provide quicker curing. This makes the radio-frequency method practicable for many new wood bonding operations.

For brief reference use IAVE — 0403.

NEW DI-ACRO CATALOG

The new 40-page Di-Acro Catalog, No. 46-11, is just off the press. It gives complete information covering the redesigned Di-Acro brakes.

The new catalog presents much new material illustrating many "Die-Less Duplicating" applications in various industries.

Di-Acro brake No. 1, used for forming a box

Di-Acro brakes, which have been redesigned and perfected, are offered in four sizes: 6, 12, 18, and 24 in. All models have a material capacity of 16-gauge cold rolled sheet steel, and the brakes may be converted easily for duplicating unusual shapes and complicated parts on a production basis.

The Di-Acro radius brake, which has all of the features of the standard Di-Acro brake, is also designed so that it can be quickly adjusted for forming chrome molybdenum and other low ductile alloys to the radii necessary to prevent fracture of the material.

For a copy of the new Di-Acro catalog write to O'Neil-Irwin Mfg. Co., 351 — 8th Ave., Lake City, Minn.

For brief reference use IAVE — 0404.

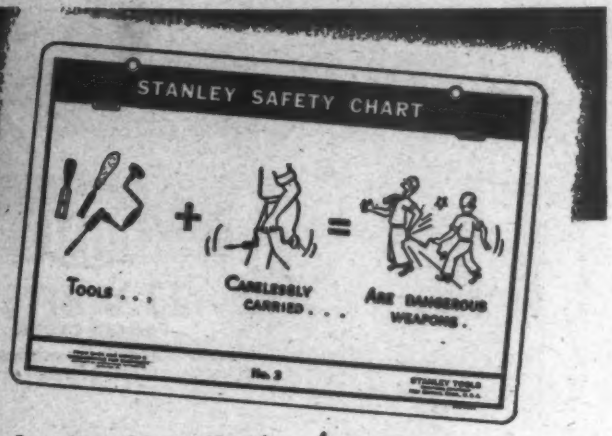
A HELPFUL CATALOG

E. H. Sheldon and Company, Muskegon, Mich., manufacturers of fixed laboratory, hospital, and vocational school equipment, announce the availability of a new 358-page catalog-handbook primarily designed to function as a helpful guide in the selection of suitable equipment for industrial and educational laboratories as well as vocational and industrial-arts departments. The handbook is sectionalized and indexed to facilitate reference to specific types of equipment.

The handbook also presents carefully engineered suggestions for the planning and laying out of

(Continued on page 36A)

NEW! STANLEY SAFETY CHARTS



A Series of 36 Pictorial Wall Charts to Promote Safety in the Use of Tools and Machines in School Shop

It is important that your students – the skilled tool users of tomorrow – be trained in ways of safety as they learn the use of tools and machinery. These charts put this idea across with simple, graphic emphasis. To promote safety in schools, as well as in future work, Stanley offers this series of charts at cost of printing and postage. No finer investment could be made in school shop training. ORDER A SET TODAY!

In each set, there are 18 cards, printed in colors on two sides – 36 charts in all. Charts are mounted on heavy cardboard, lacquered for easy cleaning, and have metal grommets for hanging.

$2.50 postpaid in the U.S.A. In Canada*, $4.10 a set postpaid.

STANLEY TOOLS, NEW BRITAIN, CONNECTICUT

THE TOOL BOX OF THE WORLD

STANLEY

Trade Mark

HARDWARE · HAND TOOLS · ELECTRIC TOOLS

Stanley Tools, Educational Dept., 1A-447, New Britain, Conn.

Enclosed is $2.50. Please send postpaid the complete set of STANLEY SAFETY CHARTS. (*In Canada $4.10 postpaid. Check or Money Order payable in Canadian Funds must accompany order. Shipment to be made from Stanley Tool Co. of Canada, Ltd., Roxton Pond, Quebec.)

Name.....

School Name.....

Address.....

City..... State.....

Detroit Public Library

HOW MUCH IS A *Picture* WORTH?

Tech Training

WE CAN — AND SHOULD — IMPROVE our all-day preparatory vocational schools, says Dr. Homer J. Smith, University of Minnesota Professor of Industrial Education. In a thought-provoking article published in the current edition of TECH TRAINING, Dr. Smith, a topnotch specialist in his field, carefully outlines salient points telling *how* we can make these improvements.

MORE PEOPLE THAN EVER are asking for copies of the latest issue of TECH TRAINING, which also features E. L. Williams of Texas A. & M. and recently elected vice-president of the A. V. A., Charles Luckman, Arthur B. Mays, J. H. DuBois, Edward C. Estabrooks, Howard Corham, and Bernard Cygor.

TECH TRAINING regularly presents outstanding contributions to current thought in vocational, technical, industrial, and business education. You can get this latest issue and subsequent issues without charge by sending us the attached coupon. Put yourself on our mailing list now.

"IT'S WORTH A THOUSAND WORDS" . . . "It tells more in a minute than does an hour's reading" . . . We believe that good illustrations are **priceless.** True — they are one of the greatest expenses in publishing, but are worth every dollar. The superior quality and added quantity is another outstanding feature of American "Tech-books."

1. **SIMPLIFIED ARCHITECTURAL DRAWING.** Buss. **More than 250 illustrations** that help bridge the gap between mechanical drawing and actual drafting room practice. Price.....$5.00
2. **HOW TO READ ELECTRICAL BLUEPRINTS.** Heine-Dunlap. **301 illustrations (9 full-sized blueprints)** that bring actual shop practices to the classroom. Price.....$3.25
3. **METALLUROY.** Johnson. The new third edition contains **225 modern illustrations** – almost double the number of any previous edition. Price.....$5.00
4. **BUILDING TRADES BLUEPRINT READING.** Dalzell. Volume I. **124 expertly drawn illustrations, including 2 full-scale blueprints.** Price.....$2.25 Volume II. **9 full scale blueprints.**
5. **PLASTICS.** DuBois. Sixth printing, third edition. **203 illustrations, 2 pages in four colors, 50 tables.** Price.....$5.00
6. **PRACTICAL DESCRIPTIVE GEOMETRY.** Rusinoff. **Over 250 practical illustrations.** Ready soon.
7. **AUTOMOBILE FUNDAMENTALS**—Chassis and Power Transmission. Kuns-Plumridge. **631 illustrations.** Price.....$4.75

Buildable Homes

8. This practical, down-to-earth book tells what you must know in order to have the house you want at the price you can pay. Price $2.50

Please send the books circled below for 30 days examination. If any of the books are adopted and 12 or more copies ordered, I will retain the adopted books as desk copies; otherwise I will return them or remit less the educational discount.

1 2 3 4 5 6 7 8

Name .....

School .....

School Address .....

Detroit Public Library

AMERICAN TECHNICAL SOCIETY Drexel Avenue at 58th St. Department HS 282, Chicago 37, Illinois

IMPORTANT SUGGESTION TO INSTRUCTORS OF ARTS AND CRAFTS!

This handicraft encyclopedia contains the actual material and 105 projects used by Mr. Dank in his Brooklyn Public School classes. Fully discusses every kind of scrap material, working techniques, and directions for instructing scrap craft students. 375 large 6" x 9" pages with 51 full pages of photos and diagramatic illustrations. So complete it is destined to become the standard guide and reference book for all teachers of handicrafts. *We suggest you send for your copy today, or request your purchasing department to do so.*

ADVENTURES IN SCRAP CRAFT

by Michael C. Dank

$4 postpaid from:

GREENBERG: PUBLISHER • 201 East 57 St., New York 22

Revised and Enlarged

THE SEVENTH EDITION OF THE

DICTIONARY OF TECHNICAL TERMS

by F. S. Crispin

A completely revised and enlarged edition of Crispin's popular technical dictionary including all the technical terms used in modern trade, industry, and shopwork. Clear, accurate, and up-to-date definitions of more than 10,000 technical terms are presented in alphabetical order for rapid reference. This enlarged edition includes over 825 new words coined as a result of special wartime technical developments. Profusely illustrated with trade derivations given for each term.

$2.75

Examination copy sent on 5 days' approval

THE BRUCE PUBLISHING COMPANY

704 Montgomery Bldg. Milwaukee 1, Wisconsin

Oregon State College Summer Sessions: June 17 to July 25, July 26 to August 29 . . . Where Living and Study are Fun!

Courses include Drafting; Freehand Drawing and Design; Elementary and Advanced Woodwork; Wood Turning; Boat Building; Recreational Handcraft *(embracing the newer materials for shop teachers and directors of "club" work)*; Machine Shop Practices; Machine and Tool Maintenance; Forging; Gas and Electric Welding; Ornamental Iron Work; Foundry Practices; Sheet Metal; Metal-Craft; Metal Spinning; Air-age Educational Seminars for Teachers; Flight Training Courses Leading to Private Pilot's License.

Special Teaching Methods; History of Manual and Industrial Education; Construction and Use of Visual Aids; Written and Graphic Teaching Aids; Shop Planning and Organization; Trade and Occupational Analysis; Philosophy of Vocational Education; Planning Vocational Courses; Organization of Regional Vocational Schools; Vocational Guidance and Counseling; Seminars, Special Studies, and Graduate Thesis. Also full programs in Education, Science, Home Economics, and general subjects.

- STAFF of noted instructors, including guest professors of national prominence. A splendid physical plant.
- GRADUATE and UNDERGRADUATE work in Industrial Arts and Vocational Education. Programs accepted by all state departments for special or secondary credit.
- PROGRAMS may be planned leading through successive summers to the bachelor's or master's degree.

For Special Summer Bulletins, write to Department of Industrial Education

OREGON STATE COLLEGE
CORVALLIS, OREGON

AUTHORIZED BY STATE BOARD OF HIGHER EDUCATION

THE PENNSYLVANIA STATE COLLEGE
Department of
INDUSTRIAL EDUCATION
1947 Summer Session June 30—August 9

Vocational Industrial and Industrial Arts Education

Doctors, Masters and Baccalaureate Degrees

Separate graduate and undergraduate curricula in vocational industrial and in industrial arts education for in-service teachers, supervisors, administrators, and other qualified individuals. Short unit courses dealing with national, state and local problems.

For further information and catalog address:
Director of Summer Sessions
Room 105, Burrowes Building

THE PENNSYLVANIA STATE COLLEGE
State College, Pennsylvania

EDUCATION . . . the key that unlocks the World of Tomorrow

MINNESOTA SUMMER SESSION

Separate Enrollment for Either or Both Terms
June 17-July 25, 1947 or July 28-August 29, 1947

FOUR-YEAR CURRICULUM—B.S. DEGREE
MASTER'S DEGREE—PLANS A-B-X-Y
INDIVIDUAL PLANS FOR PH.D. DEGREE, INDUSTRIAL ARTS AND SMITH-HUGHES, GEORGE-DEEN COURSES
EXCELLENT LIBRARY FACILITIES
UNEXCELLED RECREATIONAL PROGRAM
WIDE RANGE OF MANIPULATIVE COURSES

Correspondence concerning undergraduate work and graduate patterns may be addressed to the Department of Industrial Education, 200 Eddy Hall.

The Dean of the Graduate School, 234 Administration Building, will supply a Bulletin of General Announcement and a blank of "Application for Admission".

Bulletins and application blanks are now available from Director of Summer Session, 802 Administration Building.

UNIVERSITY OF MINNESOTA
MINNEAPOLIS 14, MINNESOTA

BRADLEY 44th SUMMER SESSION

TWO 30-DAY TERMS

June 14—July 22 **July 22—August 26**

1947

A pioneer in summer programs for teachers of Industrial Arts and Industrial Education. Undergraduate and graduate subjects. Added equipment and faculty.

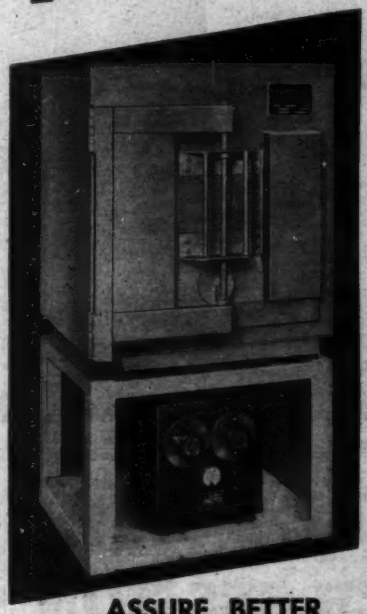
For detailed information and applications for admission address:

DIRECTOR SUMMER SESSION
Room 126, Bennett Hall

BRADLEY UNIVERSITY
PEORIA, ILLINOIS

Harper

HIGH TEMPERATURE ELECTRIC KILNS



ASSURE BETTER TEACHING PROCEDURE

Harper Electric Kilns provide instructors with sturdy, dependable classroom equipment which can be operated with confidence. They are designed for firing the entire range of clays including the finest porcelains with temperatures up to Cone 13; for decorating with enamel and glazes on glassware and metals at low temperatures.

Hinged doors are convenient and easy to operate. Production can be doubled by adding as second kiln and operating it alternately from the same transformer.

Successful firing schedules can be repeated from term to term.

Harper Electric Kilns are proven and approved by schools, industries, and studios.

Write for data.

Harper
ELECTRIC FURNACE CORPORATION
1445 Buffalo Avenue
NIAGARA FALLS NEW YORK

(Continued from page 22A)

homemaking classrooms and vocational or industrial-arts shops. Suggestions for the planning of homemaking departments are based on an exhaustive study of data supplied by the federal and state departments of education and on recommendations by leading home economists.

The sturdy handbook contains a completely illustrated listing of Sheldon products. Specifications observed in the manufacture of all Sheldon equipment are also detailed.

For brief reference use IAVE — 0405.

ACCIDENT PREVENTION AWARD

A special ceremony was held recently at The L. S. Starrett Company to mark the close of the third year during which lost time accidents were held to a record low. Operating under peak

Arthur H. Starrett, president of The L. S. Starrett Company, accepting the accident prevention award and flag

production conditions when a record number of employees were exposed to accidents, the company succeeded in holding its accident rate down to a point 76 per cent below the average for the tool manufacturing industry.

At the mass ceremony, a special Accident Prevention Flag was awarded to The L. S. Starrett Company by Parker Kemp, safety engineer of the Liberty Mutual Insurance Company.

THEY HAVE WHAT IT TAKES

Having survived a free fall of 102 miles, the two Bell & Howell 16mm. motion picture cameras, shown in the illustration, nevertheless brought their pictures back safely. Selected by the navy for the round trip of more than 200 miles in the tail of a V-2 rocket, the instruments when

— Official U. S. Navy photograph

These cameras had a long fall

recovered were described officially as being "not in operating condition, but reasonably intact." A total of eight such cameras made the 3600-mile-per-hour ascent, obtaining usable photographs of the earth's surface from a height of 40 miles. Thus Bell & Howell equipment now holds records for high-altitude performance as well as for successful operation during man's furthest descent into the ocean's depths.

NEW TEXT ON ARC WELDING

A new pictorial booklet, "Learn Arc Welding," has just been published by the Hobart Trade School, Inc., Troy, Ohio. The functions and courses of study pursued at the school are explained in this 24-page publication which may be obtained free by writing the registrar of the school.

For brief reference use IAVE—0406.

Smooth, steady power at your fingertips! Ideal tool for hobbyist, repairman, mechanic, novice or craftsman. Works on wood, plastic, metal, alloy, glass, leather, horn, stone, etc. 25,000 r.p.m. AC or DC. Wt. 12 oz.

COMPACT SCHOOL SET

A good start! Handee Tool and 40 most popular accessories in steel carrying case. Complete, postpaid, $27.50 Handee, with 7 accessories, $20.50

USE THE RIGHT ACCESSORIES—Choose them from the most complete line—more than 500 made right in the Handee plant.

ORDER NOW! SATISFACTION GUARANTEED

FREE! NEW 52-PAGE MANUAL

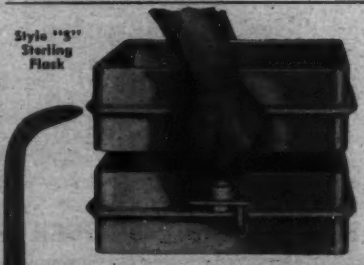
CHICAGO WHEEL & MFG. CO.
1101 W. Monroe St. Dept. 1A Chicago 7, Ill.

Materials for Brush Making

Brush Fibres, Tampico, Fibre Mixtures, Sterilized Horse Hair. Hair, Bristle and Tampico mixtures solid or taper stock, original lengths cut to size. Samples matched.

E. B. & A. C. WHITING CO.
Burlington, Vermont

Style "S" Sterling Flask



STERLING STEEL FLASKS
for Strength and Rigidity!

All-steel, all-welded, with high carbon content, Sterling Flasks combine maximum strength with minimum weight. Solid center rib and solid sand flanges at top and bottom. Full width bearing. Combination pin lugs and handles simplify handling and speed up the molding job.

Write for new Catalog No. 58.

Sterling FOUNDRY FLASKS

A 1049-R

THE STOUT INSTITUTE

MENOMONIE, WISCONSIN

1947 Summer Session

JUNE 23 - AUGUST 1

Six Weeks

Graduate and Undergraduate Courses

Industrial Arts
Trade and Industrial Education
Liberal Arts
Home Economics Education
General Home Economics
Dietetics and Institutional Food Management
Educational Workshops

- Courses and conferences in terms of the times
- Excellent teaching staff, modern facilities
- Nationally known conference leaders
- Adequate housing

Summer Session Bulletin sent on request

DIRECTOR OF SUMMER SESSION
THE STOUT INSTITUTE, Menomonie, Wis.

NEW CRAFT BOOKS

Palmetto Braiding & Weaving

V. J. Cooke and J. M. Sampley

One of the finest contributions ever made to American folklore, and at the same time the only source in book form for actual braiding and weaving patterns as developed Mother-and-daughter style through successive generations along the great Southern craft belt of the United States. Patterns of mats, bags, hats, baskets, etc., for one of the most useful crafts now available in book form. Based on the use of the palmetto leaf, but equally applicable to other materials such as corn husks, straw, etc. Early spring. $2.75

DIPLOMA ENGROSSING, Loomis	Prob.	$1.50
USE OF NATIVE CRAFT MATERIALS, Shanklin	Prob.	3.00
CANDLEMAKING, Klenke		2.00
THE PARTY TABLE, Powers		3.00
"FIRST-JOINER" CRAFTS, Jacobson		1.75

235 Duroc Bldg. Peoria 3, Illinois
THE MANUAL ARTS PRESS

PLASTICS

FOR YOUR SCHOOL SHOP

CATALIN—PLEXIGLAS

A post card will bring our price lists.

CRAFTSMAN SUPPLY HOUSE
32 Browns Ave. Scottsville, N. Y.

CLAMPS

TRADE MARK
"Jorgensen"
REG U S PAT OFF

Genuine "JORGENSEN" Handscrews are the ones which will withstand "school shop service." To avoid future disappointment, be sure you ask for and get the genuine "JORGENSEN" every time.

They cost no more than any others.

Ask for them by name.

Write for No. 16 General Clamp Catalog

ADJUSTABLE CLAMP CO.
"The Clamp Folks"
434 N. Ashland Ave., CHICAGO 22, ILL.

The 1947 Shop Annual of Industrial Arts & Vocational Education

NOW READY

The Shop Annual Number renders a comprehensive service promoting the introduction, progress, and expansion of industrial arts and vocational education. It provides an authoritative source of information and guidance in organizing, planning, and equipping school shops.

Single Copies $1.00 — Yearly Subscription, including Shop Annual Number, $2.50

THE BRUCE PUBLISHING COMPANY
Publishers
144 Montgomery Bldg., Milwaukee 1, Wis.
NEW YORK 18 CHICAGO 3

Teach Your Boys MODERN GRINDING

CN-2 ABRASIVE BELT GRINDER

Deburring
Bevelling
Chamfering
Knocking off corners
Clean-up

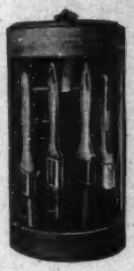
More and more, industrial shops prefer belt grinding. It's faster . . . less fatiguing . . . does better work. Eliminates wheel loading, wheel digging, wheel dressing. Grinds on contact roll, platen or free belt. Used in assembling and machining departments, tool room job shops, service stations.

Arbor on contact roll and V-pulley permit use of this unit independent of a bench grinder. Quickly adjusted for vertical or horizontal use within 90° arc. Weighs only 15 lbs. Write for full information *today*.

(Electric motor not included in CN-2 Belt Grinder.)

PORTER-CABLE MACHINE COMPANY 1702-4N. Salina St. Syracuse, N. Y.

PAINT BRUSHES
Softened While Stored



PROTEXEM BRUSH CONDITIONER employs new 'VAPOR ACTION' principle. A special solvent evaporates within the conditioner. Its vapor is a powerful solvent for the paint, varnish, enamel or lacquer in the brush. 'HARD-AS-ROCK' brushes are thoroughly softened. Keeps good brushes always ready to use.

Does Not Damage Bristle or Setting, Thoroughly Tried and Tested, Fully Guaranteed

Protexem Brush Conditioner with ½ pint vaporizing liquid.....$2.00
Extra pints of liquid..... .50

One pint of liquid will keep your shop brushes ready to use for 4 to 10 months.

Will hold six average size brushes.

Information on request

WISCONSIN LABORATORIES, INC.
625 N. 22rd Street Milwaukee 3, Wis.

METALS

are again available for Art Metal work in School Shops

Sheet Brass — Copper — Aluminum Nickel and Sterling Silver, also

Hammers — Files and Anvils for working these Metals

METAL CRAFTS SUPPLY CO.
10 Thomas St. Providence, R. I.

(Continued from page 21A)

ciples of radio but now want to learn how to apply their knowledge in radio servicing.

The author aimed at presenting the material contained in the book in a simple way without too much related theory and without mathematics.

There are 14 chapters which treat the subject under the following headings: Basic Operations Voltage Analysis, Resistance Checking and Signal Tracing; The R. F. Amplifier; The Mixer-Oscillator or Converter; The I. F. Amplifier; The Detector and AVC Circuits; The Audio Amplifier; The Power Supply; The Loud-Speaker; Alignment; Miscellaneous Troubles; Automobile Radio; Battery a.c. and d.c. Portable Receivers — Substitution of Parts and Tubes; Automatic Frequency Control — Frequency Modulation.

FURNITURE PROJECTS

Professional detail drawings, actual size, and simplified for the amateur . . . Large and small projects on sheets up to 39" x 54". . . . Traditional and modern designs for the house and garden, by a professional furniture designer.

Write for catalog.

CRAFTSMAN DESIGN SERVICE
823 Eckart St., Dept. E. Ft. Wayne 5, Ind.

Craft PROJECTS

NEW BELT DESIGNS-LEATHERCRAFT MATERIALS

47 Popular Western and Novelty Designs. Full, simple directions on each sheet. Send today! No. 397 — Only 75c
Also 9 new and different handbags including popular shoulder strap type. Complete portfolio and instructions. No. 331 — Only $1.15.
Quality Leathercraft Materials and Fittings for 29 Years. *Write for Catalog*

OSBORN BROS. 223 W. Jackson Blvd. Chicago 6, Illinois

SEEKING A POSITION?

The unusual demand for teachers of Industrial Arts and Vocational subjects offers exceptional opportunities to beginning teachers and to experienced men who are looking for advancement. Many vacancies in East and South. Write us about yourself.

THE BALTIMORE TEACHERS AGENCY
William K. Yocum, *Manager*
516 N. Charles Street Baltimore, Md.

STA-WARM TRIPLEX

3 Heat Glue Pot

A low cost, high efficiency quality Electric Glue Pot with 3 heating control —
1. Low—for intermittant use.
2. Med.—for continuous use.
3. High—for quick heating.

Write for details on its 17 advantages.

1 pt. - $7.43
1 qt. - 7.98
2 qt. - 10.18

Details also available on other Sta-Warms, 1 pt. to 8 qt., with automatic control.
STA-WARM ELECTRIC CO., Ravenna, Ohio

LUMBER FOR SCHOOLS

T. A. FOLEY LUMBER CO.

PARIS, ILL.

PAXTON

Oldest Name in the Field

INDUSTRIAL ARTS
Lumber & Plywood

FRANK PAXTON LUMBER CO.

Des Moines Denver
Fort Worth Kansas City

Electro-Typers

Especially qualified to be of service to the school printshop.

Promptness and quality assured.

Forms returned same day received.

Badger - American Electrotype Co.
600 Montgomery Bldg.
407 East Michigan St., Milwaukee, Wis.

It's Here! AMAZING NEW *Liquid* PLASTIC

Stems, flowers and insects embedded in Castolite.

Students Like Liquid Magic

Students take a new interest in project work when they make beautiful articles with Castolite, the new liquid plastic that pours like syrup. Simple to use; no heat, no pressure needed. Cast scores of interesting and valuable objects, transparent or in color; costume jewelry, buttons, toys, bookends, etc. Embed photos, coins, insects, flowers. Use common glass objects as molds. Teachers everywhere enthusiastic. This new liquid plastic serves the arts and crafts as well as science.

Experimental Kit— Now $2.95

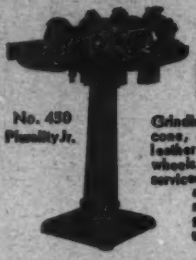
New experimental kit now ready. Contains 1 lb. Castolite, illustrated instruction manual, buffing compound, catalyst, etc. Make useful objects very first day. Send $2.95 plus 20c postage. Later buy in larger quantities (at special rates) for regular school use. Only question is: Will you or your students gain most delight from Castolite? Order today.

THE *Castolite* CO., Box A211, KENILWORTH, ILLINOIS

ELECTRIC
MOTOR PARTS
FOR ALL MAKES

ALSO ALL MATERIALS AND TOOLS USED IN THE MOTOR REPAIR SHOP
Free Catalogue to Instructors
READING ELECTRIC CO., Inc.
200 William St., New York

TOOLS ALWAYS SHARP with PLURALITY OILSTONE TOOL GRINDERS



Now available in 3 sizes
No. 425 Plurality Sub Jr.
No. 450 Plurality Jr.
No. 475 Plurality

No. 450 Plurality Jr.

Grinding can be done on a cone, coarse or fine oilstone, leather stropping or emery wheels. Unit is compact, efficient, serviceable, easily accessible and has ball bearing direct motor drive. Especially guarded for school shop use. Details on request.

Mummert-Dixon Co. Hanover, Pa.
Originators and Pioneer Manufacturers of Oilstone Tool Grinders

WOODWORKING TOOLS
CABINET HARDWARE
and SUPPLIES

LUSSKY, WHITE AND COOLIDGE, INC.
216 W. Monroe St. Dept. C4, Chicago 6, Ill.

BOWS and ARROWS
The all around good shop project that is useful, educational and entertaining. The FLAT BOW book shows how 75c excellent flat lemon wood staves $13.90 dz.: tips, nocks, ground base feathers, good cedar shafts for 100 arrows $15.25.

Indianhead Archery Mfg. Co.
Box 303—IA Lima, Ohio
No waiting, extra prompt delivery. FOLDER FREE

LOOMS, Table and Foot
Reed, Raphia, Handicraft Supplies
Send for catalog
J. L. HAMMETT CO.
CAMBRIDGE, MASS.

Heat Treating Furnaces and Equipment

FORGES—gas fired, no smoke or dirt. Sizes from the bench type at right to large floor models.
MELTERS—for aluminum, brass, lead, gold, etc., many sizes and types.
We also supply Ovens, Salt Baths, Complete Shop Tables — Blowpipes, Burners Etc.

American Gas Furnace Co.
Elizabeth, N. J.

ELECTRIC KILNS
Any Size—Any Temperature
Quick Delivery
JAMES W. WELDON
Laboratory
2315 Harrison St., Kansas City 8, Mo.

Bow and Arrow Supplies
QUALITY LEADERS FOR 15 YEARS
Shop Special
A semi-finished Archery Set with a 5' 8" Lemonwood bow pulling about 40 pounds plus a hemp string, prepared materials for six arrows, and diagramed instructions. Sells retail for $3.95.

Complete Set Bow—6 Arrows $2.95
Semi-Finished Schools Only
L. C. WHIFFEN CO. Inc.
622 W. Wisconsin Ave., Milwaukee 3, Wis.

Advertisers' Products and Services

Advertisers in this index are given a code number in addition to the page number on which the advertisement appears. Refer to the advertisement for product or services available. Write direct to advertiser or use the coupon in requesting information from a number of advertisers.

Code No.		Page No.
40	Adjustable Clamp Company	27A
41	American Gas Furnace	29A
41	American Technical Society	23A
43	Armstrong Bros. Tool Co.	6A
44	Atkins and Company, E. C.	8A
45	Atlas Press Company, The	7A
46	Badger American Electrotype	28A
47	Baltimore Teachers Agency	28A
48	Black and Decker Mfg. Co.	5A
49	Bradley University	25A
410	Brodhead-Garrett Company	15A
411	Bruce Publishing Company	24A & 3rd cover
412	Carmen Bronson Company	6A & 20A
413	Carter Div., R. L.	17A
414	Casco Products Corp.	17A
415	Castle Films, Inc.	20A
416	Castolite Company, The	28A
417	Chicago Wheel & Mfg. Co.	26A
418	Cincinnati Tool Company, The	2A
419	Columbian Vise & Mfg. Co.	2A
420	Craft Service	19A
421	Craftsman Design Service	28A
422	Craftsman Supply House	27A
423	Delta Mfg. Company, Division Rockwell Mfg. Co.	13A
424	De Walt Products Corp.	12A
425	Dick Company, A. B.	3A
426	Dixon Crucible Co., Joseph	21A
427	Foley Lumber Company, T. A.	28A
428	Greenberg Publisher	24A
429	Hammett Company, J. L.	29A
430	Harper Electric Furnace Corp.	26A
431	Indianhead Archery & Mfg. Co.	29A
432	Johnson Gas Appliance Co.	22A
433	Kester Solder Company	6A
434	LeBlond Machine Tool Co., R. K.	4th cover
435	Lewis Machine Tool Co.	30A
436	Lussky, White and Coolidge	29A
437	Maguire Industries, Inc.	17A
438	Manual Arts Press	27A
439	McKnight and McKnight	20A
440	Metal Crafts Supply Co.	28A
441	Millers Falls Company	9A
442	Morgan Vise Company	8A
443	Mummert-Dixon Company	29A
444	Nicholson File Company	10A
445	Ohlen Bishop Mfg. Co.	30A
446	Oliver Machinery Co.	9A
447	Oregon State Agricultural College	25A
448	Osborn Bros.	28A
449	Paxton Lumber Co., Frank	28A
450	Peck, Stow & Wilcox Co.	4A
451	Pennsylvania State College	25A
452	Pittsburgh Plate Glass Co.	2nd cover
453	Plomb Tool Company	9A
454	Porter-Cable Machine Co.	27A
455	Post Company, Frederick	24A
456	Reading Electric Company, Inc.	28A
457	Ruby Chemical Company	30A
458	Sheldon Machine Co., Inc.	18A
459	Snap-On Tools, Inc.	4A
460	South Bend Lathe Works	1A
461	Stanley Electric Tool Div.	2A
462	Stanley Tools, Div. Stanley Works	23A
463	Starrett Co., L. S.	16A
464	Sta-Warm Electric Company	28A
465	Sterling Wheelbarrow Co.	26A
466	Stout Institute, The	27A
467	University of Minnesota	25A
468	Wallace Company, J. D.	8A
469	Weber Company, F.	19A
470	Weldon Laboratory, James W.	29A
471	Western States Envelope Co.	30A
472	Weston Electrical Instrument Co.	19A
473	Whiffen Co., Inc., L. C.	29A
474	Whiting Company, E. B. & A. C.	26A
475	Wisconsin Laboratories, Inc.	28A

USE THIS COUPON

The advertisements in this issue have been given a code number for your convenience in requesting information on products, services, booklets, and catalogs offered. Encircle the code number of the advertisement in which you are interested, clip and mail the coupon to INDUSTRIAL ARTS AND VOCATIONAL EDUCATION. Your request will receive prompt attention. BRUCE–MILWAUKEE.

INDUSTRIAL ARTS AND VOCATIONAL EDUCATION
540 North Milwaukee St., Milwaukee 1, Wis.

Please send information offered in the advertisements we have encircled.

40	47	414	421	428	434	440	446	452	458	464	470
41	48	415	422	429	435	441	447	453	459	465	471
42	49	416	423	430	436	442	448	454	460	466	472
43	410	417	424	431	437	443	449	455	461	467	473
44	411	418	425	432	438	444	450	456	462	468	474
45	412	419	426	433	439	445	451	457	463	469	475
46	413	420	427								

Also information on .....

Name .....
Please Print

Title ..... **School** .....

City ..... **State** .....

Detroit Public Library

Prestige by mail

Whether it is for personal stationery or for business correspondence and regardless of its contents, the ENVELOPE is a representative of its sender . . . YOUR representative. And like a friendly handshake . . . though not long kept nor deeply analyzed . . . forms the first impression on the recipient.

Make your first impressions count — build prestige by mail — use appropriate envelopes.

★

WESTERN STATES Envelope Company

1616 WEST PIERCE ST. MILWAUKEE 4, WISCONSIN

★

JOB-TESTED!

FOR 94 YEARS
OHLEN-BISHOP
No. 20
COMPASS SAW

The special purpose saw of today is the outgrowth of necessity. Our early founders worked closely with the trade to furnish the type saw needed for every job. The compass illustrated above is only one of hundreds of special carpenter saws included in our complete line. When you ask for an OHLEN-BISHOP you are specifying a tool made right for the job — tested and proven throughout the years.

OHLEN-BISHOP

909 Ingleside Ave. Columbus, Ohio

THE PROOF'S IN THE USE

RUBYFLUID FLUX
IS Better for All Soldering

Ruby's BIG $1 Sample — 1 pt. of liquid and ½ lb. of paste flux is more than enough to show you why we say Rubyfluid is a better flux.

- Rubyfluid —
  - Wets out freely . . .
  - Makes stronger neater joints . . .
  - Has no harmful fumes . . .
  - Acts quickly and saves time . . .

Ruby also will send you free its new booklet of simplified instructions on "How To Solder."

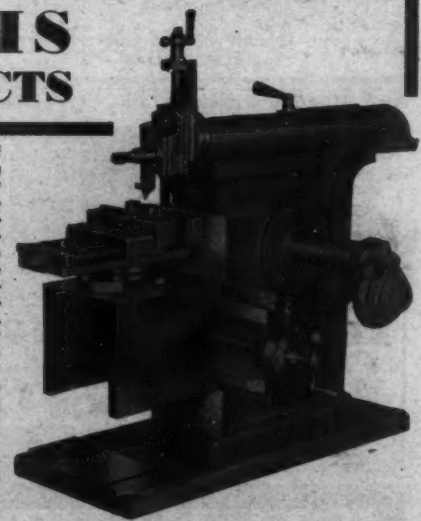
Write for the Sample and Booklet Today

THE RUBY CHEMICAL CO.
77 McDowell St. Columbus 8, Ohio

Rubyfluid

For sounder *initial* training use

LEWIS PROJECTS



The skillful machinists of tomorrow are receiving their initial training today with Lewis Projects. Developed to give sound training in machine tool fundamentals and accuracy in workmanship, they are furnished in rough or semi-finished castings with necessary assembly blueprints. Completion and assembly enable schools to equip their shops economically and give students the "know how" of machine tool construction and operation.

Lewis Projects are available in shapers, mills, jointers, circular saws, etc., at extremely low prices. Savings are as high as 80% of usual costs of comparable finished tools.

Write today for further information on the Lewis Shop Projects. Ask for the illustrated catalog—sent free.

Lewis MACHINE TOOL CO.

P.O. Box 7446 Station L, Dept X, Los Angeles 23, California

INVESTIGATE THESE SHOP TEXTS!

Completely Revised

PRINCIPLES OF WOODWORKING

By HERMAN HJORTH

Meets all the needs of an up-to-date high school course in woodworking. $2.88

INSTRUCTIONAL UNITS IN HAND WOODWORK

Brown and Tustison

Covers the entire range of hand woodworking. Extensively illustrated. Unit-instruction-sheet plan. Unit operations completely analyzed; given in clearly defined steps. Junior high school grades.

$1.80

BASIC WOODWORKING PROCESSES

Herman Hjorth

Revised and enlarged, this book presents descriptions of all the fundamental processes used by the woodworker. Profusely illustrated. Written in great detail.

$1.80

DRAWING FOR LIFE AND INDUSTRY

Daniel Green

A new approach to the teaching of drawing stressing greater application to life situations useful to all individuals. Excellently organized in terms of well-graded projects.

$1.56

BASIC MECHANICAL DRAWING

Edward Berg

A two book edition for the 9th and 10th grades. Paper: Vol. I, 64 cents; Vol. II, 56 cents. Complete: Cloth, $1.80; Paper, $1.40.

MECHANICAL DRAWING I and II

Glenn N. Shaeffer

Written especially for beginners in the upper grades of the elementary school or in the junior high school.

80 cents

Examination copies for thirty days' study

THE BRUCE PUBLISHING COMPANY

Milwaukee 1, Wisconsin

Teaching and Learning Made Easier with LeBLOND'S Easy-to-Operate LATHES

Fully Patented

NEW DUAL DRIVE

Get both low speeds and carbide speeds in one lathe—the new LeBlond Dual Drive.

12 spindle speeds: 4 high (540 to 1800 rpm); 8 low and intermediate (28 to 445 rpm) . . . Single lever speed control, with direct reading plate and arrow indicator . . . Rapid Speed Selector . . . Feed box totally enclosed . . . Swing over ways, 15"; over compound rest, 9½" . . . Distance between centers, 30" and 42" . . . Weight, 2450 lbs., net.

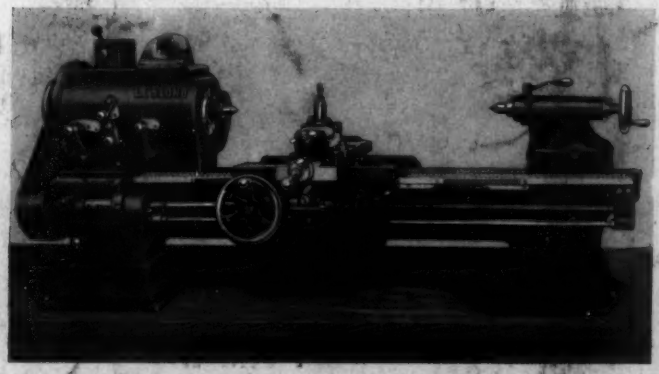
REGAL LATHE

Preferred by school shops because the same lathe is used "on the job" in industry for light work. It's the ideal training lathe.

Important Specifications

	13"	15"	17"	19"	21"	24"
Swing over ways	13½"	15¼"	17¾"	19¼"	22¼"	25¼"
Swing over compound rest	8¼"	10"	10½"	12"	13½"	17"
Distance between centers	18"	18"	30"	30"	36"	36"
Weight, net, lbs.	1045	1240	1875	2560	4290	4500

Regal Lathes in sizes 13", 15", 17" (shown), 19", 21", 24"



13" BENCH REGAL

The new 13" Bench Regal is built with all the advantages of the floor model. Faster, more powerful, and can accommodate larger work than ordinary bench lathes. With equal ease it produces close precision work on small stock.

Offering a complete range of turning within its 13½" swing capacity, the Bench Regal is essential equipment for tool room or production operations.

THE R. K. LeBLOND MACHINE TOOL CO., Cincinnati 8, Ohio
LARGEST MANUFACTURER OF A COMPLETE LINE OF LATHES
New York 6, 149 Broadway, COrtlandt 7-6621-2-3
Chicago 6, 20 N. Wacker Drive, STA 5561

© 1947, LeBlond

LeBLOND